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OUR ANALYSIS  
OF THE ACCIDENTS  
SO FAR THIS YEAR  
REPORT P26**

**ROTARY RESCUE**

Lockheed Martin makes \$9 billion bid to acquire Sikorsky brand and lift both their prospects **9**

**NEW AT OSHKOSH**

From Icon amphibian to reviving the Cessna 172, AirVenture had plenty of innovation on show **22**

# FLIGHT INTERNATIONAL

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**SURVEILLANCE**

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Northrop Grumman targets JSTARS successor, as rivals advance radar platform concepts



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## COVER IMAGE

Northrop Grumman is using this modified Gulfstream business jet to support its development work on a potential replacement for the E-8C JSTARS fleet **P34**



Jeremy Dwyer-Lindgren

## BEHIND THE HEADLINES

Stephen Trimble, pictured in front of the Beech Starship, joined thousands of owner flyers and enthusiasts for the AirVenture fly-in in Oshkosh, Wisconsin (**P22**). Craig Hoyle and Beth Stevenson travelled to RAF Fairford in the UK for the annual RIAT show (**P18**)



Rolls-Royce

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AirTeamImages

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Kristoffer Riedel/Rich Pittman

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**IMAGE OF THE WEEK**

The Aeroshell display team wowed crowds at the Experimental Aircraft Association's AirVenture show from 20 to 26 July, performing aerobatics in their North American AT-6 Texans above Oshkosh, Wisconsin. They were among 10,000-plus aircraft at the huge gathering. Show report P22

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[flight-international](http://flight-international.com/)



Jeremy Dwyer-Lindgren

**THE WEEK IN NUMBERS**

 **21%**

Flightglobal dashboard

An H1 revenue surge to €2.2bn led engine maker MTU to raise its full-year operating profit target by €10m, to €430m

**\$250m**

LCI

Total value of Airbus Helicopters to be funded through lessor LCI under a "world first" Islamic financing structure

 **224,716**

NATS

Number of flights handled in June at 14 UK airports by air traffic controller NATS – an increase of 2.5% year-on-year

**QUESTION OF THE WEEK**

Last week, we asked you to choose between these statements:  
**The lifting of sanctions on Iran...**

**57%**

Will prompt Airbus and Boeing commercial sales

**23%**

Is good news for China and Russia

**TOTAL VOTES:  
1,197**

**20%**

Won't last beyond 2015

This week: **Lockheed Martin's plan to acquire Sikorsky:**

- Great deal for both
- Good money after bad
- Still too many helicopter manufacturers

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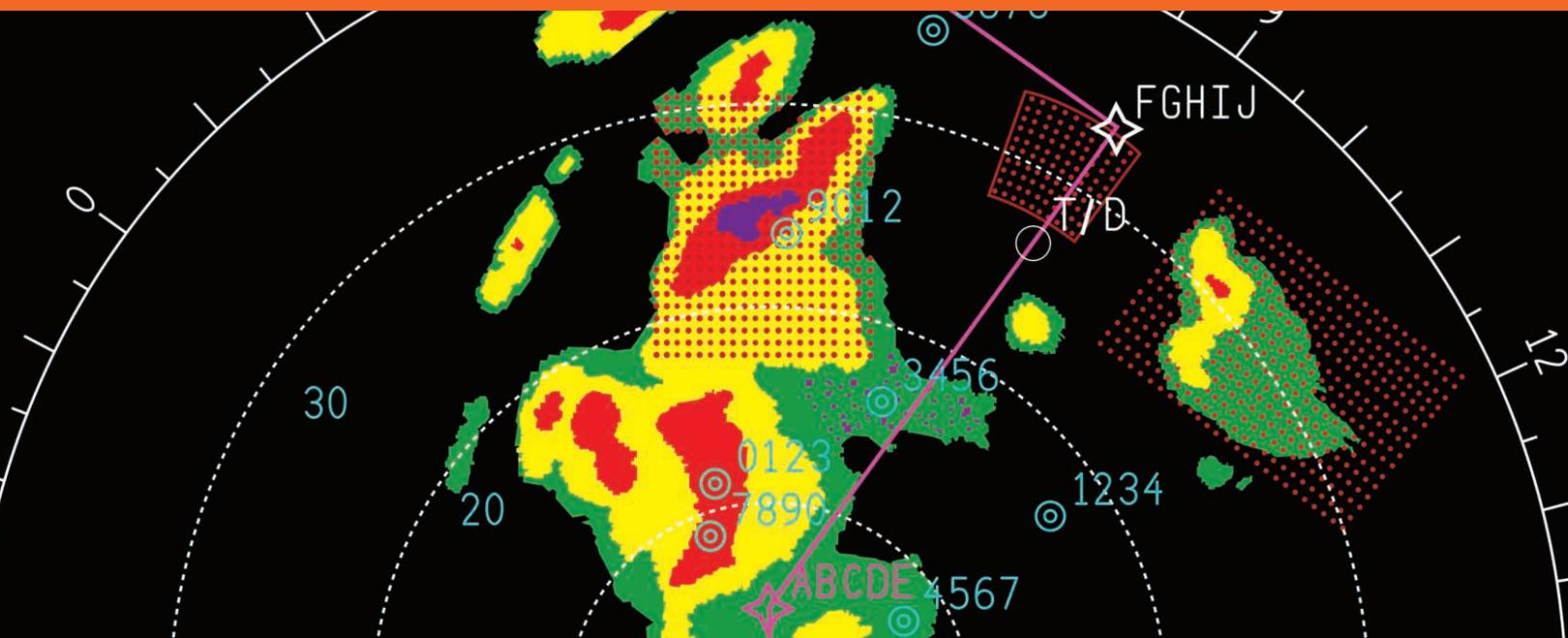
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# Last man standing

No seismic shifts will come from Lockheed Martin's purchase of rotorcraft industry stalwart Sikorsky. But with apparent overcapacity in the segment, perhaps an earthquake was needed

**L**ockheed Martin's proposed \$9 billion acquisition of helicopter manufacturer Sikorsky is not as transformative as it might initially appear.

And that view applies equally to the wider rotorcraft landscape as to the companies involved.

But to start with Sikorsky, the deal is undoubtedly good news. Under the ownership of United Technologies (UTC) it seemed lost, not adrift exactly, but without a clear sense of direction.

It was very much the junior party in revenue terms, dwarfed even by UTC's elevators and climate control businesses.

So, being part of a larger defence prime makes broad strategic sense. Lockheed believes Sikorsky can benefit from its programme execution experience (although some will point to the F-35 as evidence to the contrary) and its ability to sell government customers an expanded range of weapons systems.

## The acquisition does nothing to address the issue that there are too many helicopter producers

It also addresses Sikorsky's weakness on the international sales front, while simultaneously dealing with Lockheed's failings in terms of aftermarket sales and strategy. Oh, and it adds \$6.5 billion in revenue.

The picture is less clear-cut on the commercial side, however. Thanks to its ability to be used as either a civil or military platform – and its position as one half of a duopoly in the offshore transportation industry – the S-92 should enjoy a strong future under its new owner. It may need a refresh – a B model in Sikorsky parlance – but that is likely to be money well spent.



Rex Features

### "Lockheed who?"

The same cannot be said of the S-76D. Sales have been poor. Whether Lockheed will persist in a market where it faces competition from all sides remains to be seen.

For Europe's big two rotorcraft manufacturers, the picture, particularly in relation to the US defence market, has also not altered markedly.

Washington has shown willingness to write its requirements in such a way as to favour its national champions. The tie-up is unlikely to change that instinct.

But while the acquisition helps to secure Sikorsky's future, it does nothing to address the basic issue that there are too many helicopter producers.

In fact, there are three major firms – Bell, Boeing, and Sikorsky – in the USA alone. And with Department of Defense spending on a downward trajectory, that seems like one too many.

Therefore, if Sikorsky has secured its future, the question must be: who has not? ■

### See This Week P9

## Regulation stifling safety

**W**hen a general aviation aircraft enters the market with critical new safety features, it should only be a positive story. But when such additions were made possible only because Icon Aircraft's sporty A5 seaplane falls outside the standard Federal Aviation Regulations (FAR), the story becomes "embarrassing", says former Cessna chief executive Jack Pelton.

The A5 is certificated as a special-light sport aircraft in the amphibian class, so escaped the complex, costly and often self-defeating FAR Part 23 standards that apply to all general aviation aircraft weighing over 599kg (1,320lb), unless granted an exemption.

Icon's safety features – a spin-resistant wing and an angle of attack indicator – should be pervasive across

the general aviation industry. Both address the single-largest cause of GA accidents, namely loss of control at low altitude, especially on a final turn before landing.

But the cost and complexity of certifying new technologies under Part 23 often renders the business case impractical, if not impossible. It is an overly blunt instrument that forces small, piston-powered aircraft to complete tests designed for the most advanced, jet-powered business types. So many safety-enhancing technologies fall outside the reach of a market sector that statistics show needs it more than any other.

A long-delayed rewrite of the rules is under way, with a 2017 deadline. It cannot come soon enough. ■

### See Show Report P23



To access more coverage about the global rotorcraft sector, visit our dedicated landing page: [flightglobal.com/helicopters](http://flightglobal.com/ helicopters)



# BRIEFING

## XIAMEN EYES STRETCHED DREAMLINER

**FLEETS** China's Xiamen Airlines is in discussions with Boeing for the 787-9 and could make a decision within weeks. The carrier, which already operates the 787-8, is planning to use the bigger, longer-range aircraft on routes to North America, an official familiar with the talks says. Its last of six on-order -8s is scheduled for delivery in September. The airline has so far used the type for services to Beijing, Chengdu and Fuzhou and was due to add Amsterdam on 26 July. It also will fly the Dreamliner to Sydney from the end of this year.

## SECOND AIRSEEKER TO ARRIVE EARLY FOR RAF SURVEILLANCE

The UK Royal Air Force will receive its second Boeing RC-135W Rivet Joint/Airseeker aircraft in September, seven months earlier than scheduled. To be operated by the service's 51 Sqn, the signals intelligence-gathering asset should "be deployable in a matter of weeks after delivery," the Ministry of Defence says. The first of the UK's eventual three Airseekers is supporting coalition operations against Islamic State militants in Iraq and Syria.

## AIR PEGASUS MAKES FLYING START

**DEMAND** Indian start-up Air Pegasus will grow to a fleet of eight ATRs next year, with the regional carrier enjoying higher-than-forecast load factors of around 80%. Managing director Shyson Thomas says two ATR 72s are already in use, with this to rise to five by year end and by three more during 2016. The Bengaluru-based carrier, which launched services on 12 April, will focus on south India for the next two years before seeking out destinations in the east of the country.

## BOOK NOW OPEN FOR RUSSIA'S ANGARA ROCKET LAUNCHERS

A Russian space programme dogged by recent launch failures and an impending budget cut got a boost last week, with the formal opening of sales for flights from 2017 on its new Angara 1.2 light launch vehicle. In April a Soyuz-Progress mission to resupply the International Space Station ended in the sea, while an experimental military launcher failed within seconds of launch and space agency Roscosmos reported facing a 35% budget cut over 10 years.

## UK CAA SPEARHEADS UAV SAFETY INITIATIVE

**CAMPAIGN** The UK Civil Aviation Authority is linking with national air navigation service provider NATS and pilots' union BALPA to raise awareness of the potential risks to air traffic from the recreational flying of unmanned air vehicles. The CAA is assisting the creation of an online resource to provide advice on safe operations and says the observation of strict rules is "imperative", particularly in the light of several recent encounters involving commercial aircraft.

## WATCHKEEPER ON OFFER FOR POLISH DEAL

**PARTNERSHIP** Thales and WB Electronics are offering to build a Polish tactical unmanned air vehicle, to be based on the British Army's Watchkeeper 450. Warsaw wants to acquire 12 Gryf systems to enter service from 2017, each with four rocket-armed air vehicles.

## SPACE STATION BACK UP TO FULL CREW LEVEL

**SPACEFLIGHT** The International Space Station is back up to its full crew complement of six, following the arrival of three astronauts, from Japan, Russia and the USA, via a Soyuz flight from Baikonur. The station had been down to three crew since 11 June. Following two failed resupply missions, concerns about station stores were relieved by a successful supply flight earlier in July.



Anthony Pecchi/Dassault

The B-model aircraft were originally destined for French service

**FIGHTERS** CRAIG HOYLE LONDON

## Egypt takes first exported Rafales

Initial delivery comes five months after deal for 24 aircraft

**D**assault has delivered its first three Rafale combat aircraft to its Egyptian customer, five months after securing a 24-unit contract from the North African nation.

The aircraft were flown to Cairo on 21 July, one day after having been accepted by Egyptian officials at Dassault's Istres flight test centre in the south of France.

"An initial group of Egyptian users has been trained," the company says, with these French air force-instructed pilots having

performed the delivery flights.

Signed in February, Egypt's order is for eight single-seat Rafale Cs and 16 twin-seat B examples. Its first trio – Rafale Bs – were diverted from delivery to the French air force.

Dassault says the Rafale's introduction will support its new operator in "meeting the country's operational requirements and enabling Egypt, with full sovereignty, to secure its geostrategic position in the region". ■

**PROPELLION** MAVIS TOH SINGAPORE

## C919 takes a Leap towards debut

**C**FM International has delivered the first Leap-1C engine to Comac for its in-development C919 narrowbody.

Sent to the Chinese manufacturer's final assembly centre near Shanghai, the engine will be installed on the first C919 flight test aircraft – expected to be rolled out by the end of this year and to achieve first flight during 2016.

Comac says a second engine will be delivered within two weeks, with installation onto the prototype scheduled to take place shortly after. Final assembly of the C919 airframe has largely been completed, with installation of airborne systems to begin soon.

A first Leap-1C completed a

flight test programme in late 2014 on a modified Boeing 747 flying testbed at GE's facilities in Victorville, California.

CFM says there are currently more than 30 Leap engines on test or in final assembly and that the programme has logged more than 4,730 certification ground and flight test hours. ■



Leap-1C arrives in Shanghai



Secure cockpit door rules should remain, says EASA  
THIS WEEK P10

THIS WEEK

ACQUISITION JAMES DREW WASHINGTON DC

# Lockheed flies in to rescue Sikorsky

Proposed deal for \$9 billion will boost new owner's military and commercial offerings, and safeguard rotorcraft sector icon

**W**ith a \$9 billion offer, Lockheed Martin appears to have secured itself what company executives describe as a "national icon" in the form of helicopter manufacturer Sikorsky.

Announced on 20 July, the deal will see the 90-year-old rotorcraft stalwart acquired from current parent company United Technologies, which is divesting the business to concentrate on higher-margin businesses in its portfolio.

The purchase sees Lockheed add another set of products to its military portfolio. It also means it is branching out into the commercial segment, C-130 derivatives aside, for the first time since the end of L-1011 TriStar production in the early 1980s. It will also help to address a weakness in the after-market services segment, it says.

And it gives Sikorsky a major boost on the international market, where it has previously been found wanting.

David Wireman, aerospace and defence analyst with consultancy AlixPartners, believes that Airbus Helicopters, in particular, will feel the impact of the tie-up.

"They've been trying to find ways to enter the US market and now they have a fully integrated vertical-lift prime contractor that plays in a lot of the same space that they do."

"And that doesn't limit itself to the USA. I'm sure there are going to be international competitions that Lockheed is going to be more aggressive about going after," he says.

## PLANNED SPENDING

According to UTC, Sikorsky commands 65% of the US Department of Defense's planned future spend on rotorcraft, on programmes such as the US Marine Corps' CH-53K, the US Air Force's HH-60W combat search and rescue helicopter, and continued production of the UH-60 Black Hawk. Meanwhile, Boeing and Bell Helicopter will take 25% and 10% respectively of the proposed rotary-wing budget.



US Air Force

Together in perfect harmony? A US Air Force C-130 combat tanker refuels an HH-60 Pave Hawk

Bruce Tanner, Lockheed's chief financial officer, described the acquisition to analysts as having "pretty low execution risk" as it is buying a set of programmes rather than "a new business model and new marketplaces and new customers that we've never dealt with before."

He believes that Sikorsky will benefit from Lockheed's ability to "bundle" goods and services together for defence customers, as well as its ability to offer experience – what he describes as its "scars" – on successfully executing development programmes.

"We think when we get Sikorsky into the fold, we are people who've sort of been through this a lot of different ways, who can help with that process," he says.

In part, those development hurdles were one reason for UTC's divestment decision, despite revenues that are forecast to hit \$6.5 billion this year. Speaking on 21 July, Greg Hayes, UTC chief executive, said Sikorsky will have "a tough couple of years in front of it" as it deals with "some big development issues and programmes they've got to get past".

Sikorsky also brings with it a sizeable commercial business comprising the S-92 and S-76D, but Teal Group vice-president of analysis

Richard Aboulafia believes the customers for those helicopters are relatively closely aligned with the rest of the business.

Lockheed chief executive Marillyn Hewson says that despite lower near-term revenue from the oil and gas segment because of falling crude prices, the business is likely to rebound in the next few years.

## SYNERGIES AND SAVINGS

The biggest customer of both Lockheed and Sikorsky is likely to see some benefit, however, through synergies and cost savings. Lockheed says it will be looking to "rationalise" the Lockheed-Sikorsky workforce and facilities, and better align its supply chain once the acquisition is complete in late 2015 or early 2016.

One slight anomaly, however, is the US Army's joint multi-role technology demonstration (JMR-TD) programme, where it is now effectively competing against itself.

Lockheed is currently teamed with Bell to produce the V-280 Valor, a third-generation tiltrotor, and Sikorsky is partnered with Boeing to produce the SB-1 Defiant compound-coaxial helicopter. JMR-TD is an eventual bridge to a longer-term future vertical lift (FVL) requirement, assuming that becomes a programme of record.

Lockheed says it intends to maintain those relationships on both sides, although Tanner cautions that a lot could change between now and the start of FVL – chiefly the army's requirements.

"Whether that ends up being the programme we think it is today or not is anyone's guess," he says. "It's hard for me to get too excited about where we sit today with something that's not going to come to full-rate production for 15 or 20 years."

The programme is designed to deliver the next-generation of medium-lift attack and utility rotorcraft for the service, and could replace the UH-60 Black Hawk and Boeing AH-64 Apache if it ever gets under way.

But what the Sikorsky buy fails to address is over-capacity in the market. Hewson was at pains to emphasise that it was not "reducing the number of competitors at all in this segment".

That may not necessarily be a good thing, argues Aboulafia. "Before this move, you had three helicopter primes, which is arguably one more than the USA needs."

"After this move, we have three helicopter primes, which is still arguably one more than the USA needs." ■

Additional reporting by Dominic Perry in London



**ROCKETS DAN THISDELL LONDON**

## SpaceX blames Falcon 9 loss on tank strut failure

SpaceX's Falcon 9 rockets will be grounded until at least September, as the company studies the cause of a 29 June launch failure.

Preliminary assessment of telemetry data from the flight, which was carrying supplies to the International Space Station, indicate the failure of a strut supporting a second-stage helium tank, which resulted in over-pressure and destruction of the stage.

SpaceX founder Elon Musk says the first stage had performed without issue, and continued to provide power for several seconds after the second stage failure began, about 139s after lift-off from Cape Canaveral in Florida.

The Dragon cargo capsule would have survived the accident had its parachute been deployed by software which will be used during all future missions, he adds.

Reverifying the roughly 2ft (0.6m) long steel strut design is a "few months" work, but a more extensive analysis will push a return to flight back until at least September. ■



**A September return is possible**

**SAFETY DAVID KAMINSKI-MORROW LONDON**

## Secure cockpit door rules should remain, says EASA

Recommendation requiring two personnel in cockpit at all times is deemed sufficient

European safety authorities believe there is no need to amend requirements on secure cockpit doors in the wake of the Germanwings Airbus A320 crash.

The European Aviation Safety Agency says a recommendation that airlines should require two personnel to be present in the cockpit at all times is sufficient to mitigate the risks associated with possible sabotage by a lone occupant.

The recommendation's benefits should be reviewed after a one-year period, it adds, and "operators should introduce appropriate supplemental measures, including training for crew to ensure any associated risks are mitigated."

EASA established a task force to look into the implications of the 24 March crash in southern France, after investigators revealed that the first officer had locked the captain out of the cockpit before deliberately putting the aircraft on a collision course with terrain.

The task force looked into whether the rules governing secure cockpit doors should be revisited, particularly given that a manual lock, used to supplement



**An EASA task force was established after the Germanwings crash**

electronic ones, can be activated by a pilot left in the cockpit.

"In the past, the risk of illegitimate use of the manual lock from inside the cockpit was not fully assessed," says the EASA analysis. The use of the manual lock is "very rare", it adds, with data from 10 European airlines suggesting it is activated just once in 250,000 flights.

"The task force has not identified presently suitable alternatives to the manual lock to guarantee security in case of the failure of the automatic system," it states.

EASA says the task force "does not see it necessary" to recommend any further immediate action on cockpit door locks, because it believes that possible risks arising from illegitimate use of the manual lock can be "mitigated" with the two-person recommendation.

EASA concludes that the "greatest scope" for improvements following the Germanwings crash is "not related" to cockpit doors, but to areas such as aeromedical assessment. ■

**See Feature P26**

**GUIDANCE DAVID KAMINSKI-MORROW LONDON**

## Task force outlines importance of pilot psychological reviews

Pilots should undergo initial and recurrent psychological evaluations as part of their training regime, according to EASA's task force convened in the aftermath of the Germanwings tragedy.

Psychological examinations, as part of the aeromedical assessment for cockpit crews, should be reinforced and the training for those conducting them should be strengthened, it says.

EASA says that it will prepare guidance material on the matter, following the recommendations of its task force which looked into ramifications of the 24 March crash.

Between 1980 and 2011 there were 31 commercial air transport accidents in which medical circumstances played a role, including 20 relating to psychiatric conditions. Of those, 60% involved drugs or alcohol.

Owing to their training path, the task force points out, some entrants to commercial flying might never undertake an initial psychological evaluation. EASA aims to address this by recommending that all pilots be subjected to psychiatric assessment.

It is seeking to strengthen the psychological part of pilot assessment, adding that the role of aeromedical

examiners in advising pilots, notably between formal medical assessments, should be underlined.

Carriers' safety-management systems, the task force says, should include provisions to ensure that psychological evaluations have been conducted. It adds that periodic review should be considered if a pilot has suffered a period of mental illness.

EASA is also recommending that mandatory drug and alcohol testing should be implemented, as part of a random programme, and included during initial medical assessments. ■



**A320neo tipped for service in December with PW1100G**  
**AIR TRANSPORT P12**

**THIS WEEK**

**FINANCIALS** JAMES DREW WASHINGTON DC

# Tanker charge blights Boeing results

KC-46A development issues hit the bottom line, but chief executive is upbeat about otherwise positive second quarter

**B**oeing chief executive Dennis Muilenburg did not mask his disappointment that the KC-46A tanker blemished what would have otherwise been a stellar performance by the company in the second quarter, both in the defence and commercial portfolios.

The company announced a \$536 million after-tax charge because of development issues related to the tanker's integrated fuel system, in what was the first piece of bad news Muilenburg had to deliver to investors since taking over from Jim McNerney earlier in July.

"The integrated fuel system is the last major system to undergo component qualification testing and no new technology is needed to resolve these issues, which are well defined and understood. But that in no way mitigates our disappointment in having to take this charge," Muilenburg said during a 22 July earnings call.

## DATE COMMITMENT

The issues were discovered during recent ground and flight testing, and changes must be made to the programme's first four development aircraft. However, Boeing remains committed to delivering 18 KC-46As to the US Air Force by 2017 as required under its fixed-price contract, and Muilenburg adds: "We remain confident in the long-term



AirBamimages

**FedEx has committed to taking at least an extra 50 767 freighters**

financial value of the tanker programme for our company, with potential market of up to 400 aircraft worth \$80 billion."

On the commercial side, revenue increased by 18% to \$16.9 billion, with a record 197 aircraft delivered in the second quarter. Boeing Defense, Space and Security revenues also climbed by \$7.5 billion, with the delivery of 54 aircraft, two satellites and a strengthened services business linked to an international contract extension for the F-15. The unit also sold all but one of its remaining C-17 strategic transports during the period.

Boeing has made progress with 777 sales, securing 44 firm commitments so far this year and keeping it on track to bridge a looming gap between production

of the current model and next-generation 777X. Muilenburg says the 777 line is essentially "sold out" for 2016 and 50% booked for 2017, and that the company is now starting to look at orders for 2018 with a "strong demand signal" from the market.

**"We remain confident in the long-term financial value of the tanker programme for our company"**

**DENNIS MUILENBURG**

Boeing chief executive

"We know how to do this. We've built bridges on our other production lines, and we'll make sure it's done as efficiently as we can," says Greg Smith, Boeing chief financial officer. The company's strategy has not changed in relation to the 777, and its sales teams still need to book between 40 and 60 orders per year to smooth the transition until the first 777X enters final assembly in 2018.

Smith also says the loss-making 787 programme is on track to become cash-positive in 2015, even though deferred production costs grew by a further \$790 million in the second quarter, to hit \$27 billion.

"We continue to expect it to grow at a similar level next quar-

ter before a healthy decline in growth in the fourth quarter," he says. "On 787-8, we've seen a decline in unit cost of approximately 35% over the past 210 deliveries. Further, 787-9 unit cost declined 30% over the first 34 aircraft delivered."

## HIGHER PROFITABILITY

Production rates for the -8 and -9 versions are now balanced as the programme moves into full-rate production, and Smith expects higher levels of profitability from the latter, as further costs are driven out of assembly.

Boeing sees continued strong demand for the single-aisle 737 Max and 767, particularly after an announcement by FedEx that it will buy 50 -300 freighter examples of the latter, and take an option for 50 more.

Worth a potential \$8 billion at list prices, the commitment should reduce structural costs, and improve fuel efficiency and reliability, says FedEx.

The Memphis, Tennessee-based operator still has 35 767 freighters to come from an earlier deal for the type, and says it has now placed firm orders for 106 of the GE Aviation CF6-powered type.

"This is the largest single order in the history of the 767 programme," says Smith of the FedEx deal. The company is examining whether to increase its assembly rate beyond two aircraft per month in 2016 due to the current "upward pressure" to accommodate the FedEx order and KC-46A, he adds.

Elsewhere, NASA contracted the company for a human space flight mission as part of the commercial crew programme, and Congress has so far been supportive of proposed budget add-ons to acquire 12 more F/A-18 Super Hornets for the US Navy, which would extend production at its St Louis site in Missouri. ■

**Additional reporting by Stephen Trimble**



**Congress is supporting US Navy plans to buy 12 more F/A-18s**



FLEET TOM ZAITSEV MOSCOW

## Iran pursues Superjet deal with Russia

Russo-Iranian negotiations are continuing towards a proposed wet-lease agreement covering several Sukhoi Superjet 100 regional airliners.

"There are as-yet inconclusive talks to this end," confirms Russian transport minister Maksim Sokolov, noting that Iran shows "a steady interest in new [Russian] aircraft types".

He declines to elaborate, but industry sources familiar with the matter say the deal would involve Moscow-based operator Red Wings wet-leasing out Superjets.

Since January, Sukhoi has supplied three Superjets to Red Wings, and two more deliveries are due by year-end.

Under a follow-up agreement with the airframer, Red Wings expects to receive a further five of the type over the next year.

Red Wings managing director Yevgeny Klyucharev recently said it was looking to wet-lease three of these aircraft to foreign carriers. ■

## EVA Air confirms its order for five 777 freighters

Taiwanese carrier EVA Air has finalised an order for five Boeing 777 freighters announced at the Paris air show in June.

The deal is valued in excess of \$1.5 billion at list prices.

Flightglobal's Ascend Fleets database shows that EVA has 13 freighters in its fleet, with three 747-400Fs and five 747-400SFs in service and five MD-11 freighters in storage. ■



The order is worth \$1.5 billion



Airbus

UTC executives say the aircraft is still on course to be flying commercially before the end of the year

PROGRAMME DAVID KAMINSKI-MORROW LONDON

## A320neo tipped for service in December with PW1100G

Pratt & Whintey-powered version to resume test-flights soon, as technical fault is corrected

United Technologies (UTC) expects entry into service of the Airbus A320neo to take place in December, following the technical delay affecting Pratt & Whitney PW1100G engine testing.

Flights with the two A320neo test aircraft powered by PW1100Gs have been suspended for several weeks while a component manufacturing fault is corrected.

UTC chief executive Greg Hayes, speaking during a second-quarter financial update on 21 July, said he expected the aircraft to resume flying "early next week".

The upgraded engines have been podded and shipped by the powerplant manufacturer.

Hayes adds that the flight-test programme will be completed around September, with certification following in November and entry into service taking place in December.

Qatar Airways is due to be the

first customer to receive the A320neo. Airbus had originally expected service entry in October.

"These things just always take more time, but it's not like the [A320neo development crews] have been sitting there doing nothing," says Hayes.

"They have been doing a lot of ground-test runs and other testing that they can do before return to flight, so we feel pretty good

about the schedule right now."

Hayes says that the company is still aiming for year-end entry into service, adding that UTC is forecasting shipping some 36 engines to Airbus this year. "We're still on schedule to do that," he adds.

Between them, the two PW1100G-powered jets have completed more than 175 flights, totalling over 560h. ■

### TESTING

## Leap-powered variant returns to flight

Airbus has resumed testing of the CFM International Leap-powered A320neo, after a break to upgrade the powerplants and onboard equipment.

The airframer currently has a single aircraft with Leap-1A engines in the development fleet, but had temporarily halted tests with the type.

Airbus says the A320neo has been undergoing a "short pause" for

maintenance to prepare the aircraft for the hot-weather and high-altitude test phase.

The manufacturer has also upgraded the flight-test installation on the jet. It was returned to flight on 15 July.

Since its maiden flight on 19 May the Leap-powered aircraft has accumulated around 150h across some 45 cycles. ■



FORECAST JON HEMMERDINGER WASHINGTON DC

# Pilot demand set to soar as fleet grows

Boeing revises outlook upwards from previous year to 560,000 through 2034, also raises forecast for technicians

Demand for new commercial airline pilots will surge to 558,000 between 2015 and 2034, with airlines in the Asia-Pacific region accounting for nearly half of that requirement, according to a new study by Boeing.

In its 2015 *Pilot and Technical Outlook* report, Boeing also predicts the commercial aviation industry will need 609,000 new maintenance technicians through 2034.

Demand will grow, says Boeing, as the world's airlines add about 38,000 new aircraft to their fleets over the next 20 years.

Boeing has revised both forecasts upwards since 2014's 20-year outlook, with demand for pilots and technicians growing by 4% and 5% respectively over last year's predictions.

"Overall, global demand for these skilled resources will be driven by continued economic expansion, resulting in an average requirement for about 28,000 new pilots and more than 30,000 new technicians every year," Boeing says.

Airlines in Asia-Pacific account for most of the projected demand, with Boeing estimating the region's carriers will need 226,000 new pilots and 238,000 new technicians through 2034.

Likewise, European airlines will require 95,000 new pilots and 101,000 new technicians,

those in North America 95,000 new pilots and 113,000 new technicians, and those in Latin America an expected 47,000 of each, Boeing believes.

The report projects demand for 60,000 new pilots and 66,000 new technicians in the Middle East, 18,000 new pilots and 22,000 new technicians in Africa and 17,000 new pilots and 22,000 new technicians in Russia and the Commonwealth of Independent States by 2034.

Boeing itself has a number of training academies globally and last year attained a record output of technicians and pilots. However, Sherry Carbary, vice-president, Boeing Flight Services, acknowledges there needs to be a more comprehensive global effort.

"We will continue to increase the amount of training we provide, enabling our customers to satisfy the world's growing appetite for air travel," she says.

"The challenge of meeting the global demand for airline professionals will not be solved by one company alone. Aircraft manufacturers, airlines, training equipment manufacturers, training delivery organisations, regulatory agencies and educational institutions are all stepping up to meet the increasing need to train and certify pilots and technicians." ■



Some 609,000 technicians will be needed over the next 20 years



Airbus

All 12 of Saudia's A330 regionals will use Trent 700 engines

ORDER DAVID KAMINSKI-MORROW LONDON

## Saudia remains loyal in Trent selection for A330

Middle Eastern carrier Saudia is staying with the Rolls-Royce Trent 700 for a batch of newly-acquired Airbus A330s.

Saudia is taking 20 A330-300s, which will be configured as the lower-weight, high-density regional version of the twinjet.

The airline's current A330 fleet of 12 is powered by the Trent 700 and R-R confirms that it is supplying the engine type to lessor IAFC, from which Saudia will lease the additional aircraft.

**The A330-300s will be configured as the lower-weight, high-density regional version of the twinjet**

"It offers excellent performance and reliability," says Saudia director general Saleh bin Nasser Al-Jasser.

IAFC chief executive Moulay Omar Alaoui says the Trent 700 is the "best solution" for the aircraft, which it ordered on 15 June.

R-R values the agreement at \$930 million. Saudia has also reached a long-term maintenance deal with the manufacturer, worth \$1.3 billion.

The deal offers a boost for R-R, which recently identified profit headwinds of £250 million (\$388 million) for 2016, based on uncertainties over future Trent 700 production ahead of the transition to the Trent 7000 on the A330neo from 2017. ■

## PROPELLION

### R-R picks ITP for UltraFan research work

Rolls-Royce is engaging with its Spain-based joint venture ITP to carry out intermediate-pressure turbine research for its UltraFan high-bypass engine programme.

The programme aims to develop powerplants with a 25% cut in fuel burn compared with earlier R-R Trent engines for long-haul jets.

Under the €43 million (\$47 million) research project, ITP will design, build and test intermediate-pressure turbines and other aft structures for

a demonstrator engine, says R-R. ITP will provide the balance of the funding after a contribution of €23.5 million from EU finance under its Clean Sky 2 public-private joint technology scheme.

The company – of which R-R owns almost 47%, with Spain's Sener holding the remainder – says the funding amounts to its single-largest investment in technology.

UltraFan is intended to become available from around 2025. ■

Lufthansa Technik

Lufthansa Technik



PROCEDURES DAVID KAMINSKI-MORROW LONDON

# FAA warns on intermodal containers

Safety regulator cautions 747 freighter operators that improper loading of units could cause severe damage to aircraft

US safety regulators have taken the unusual step of using an airworthiness directive to warn carriers about risks associated with incorrectly transporting intermodal containers on Boeing 747s.

Intermodal shipping containers, commonly used throughout the logistics industry, are incompatible with most aircraft cargo-loading systems. However, they can be placed on an approved pallet and loaded into the centre of the 747 freighter, secured with suitable netting and standard restraints.

The US Federal Aviation Administration is concerned, however, that some operators are loading the pallets instead on the aircraft's left and right pallet positions.

On these positions a standard 8.5ft (2.6m) height container is too tall to fit comfortably within the fuselage, so operators are shifting the container inboard – which moves them off the pallets – and attaching them to the pallet with a net or straps only.

This "offset method" introduces slack in the net, says the FAA, adding that it has observed slack amounting to 9in some cases.

Although additional straps have been used to tie the containers to their pallets, the FAA says



The containers are unsuitable for the majority of freighter aircraft

**"There is no offset method for restraining intermodal containers that has been demonstrated to be safe and compliant"**

**FEDERAL AVIATION ADMINISTRATION**

that these "are not effective" – with the result that the containers, typically 20ft long, can shift during flight.

Analysis of the shift shows that

a container could damage as many as 10 fuselage frames – potentially resulting in structural failure of the aft fuselage.

The FAA does not normally use airworthiness directives to deal with non-compliance of existing regulations. "But because of the widespread nature of these [offset] practices, the FAA has determined that issuing [a directive] is the most effective means of addressing this unsafe condition," the authority states.

It points out that Boeing and a number of cargo operators last

year attempted to demonstrate, with full-scale tests, that the offset method on 747s complied with regulations.

But the test backfired, generating excessive deflections and failures of the aircraft cargo-loading system, and served only to justify the FAA's concerns.

Further tests were arranged, says the FAA, resulting in a "complex" method of procedures and strapping intended to counter the problem of potential shift. However, it adds: "While a few load cases were successful, some had very small margins – precluding any reduction of the complexity of the nearly 100 straps required."

These restraint proposals were abandoned as "unviable", it states, and subsequent efforts to determine a safe offset-loading method for the 747 have been unsuccessful. "At this time, there is no offset method for restraining intermodal containers that has been demonstrated to be safe and compliant," it adds.

Several operators and organisations have objected to various parts of the directive, including IATA, which has pointed out that intermodal containers have been carried safely for 40 years. ■

SAFETY AARON CHONG SINGAPORE

# Shaheen aircraft grounded for maintenance issues

Pakistan's Civil Aviation Authority (CAA) has grounded four aircraft operated by Shaheen Air International, due to persistent safety concerns.

The agency says the aircraft are two Airbus A330s, one A320 and a Boeing 737-400.

It says they were grounded as "they were not properly maintained, and had various issues such as loose components and rusty parts".

"All four aircraft will undergo an airworthiness test shortly after the airline has showed us

that they have [performed] the proper maintenance," the agency says.

The two A330s, registered AP-BKL and AP-BKN, were built in 1994, while the A320 (AP-BLI) is a 1998-built airframe and the 737-400 (AP-BJQ) dates from 1993. All four aircraft are leased in.

Shaheen operates a total of 14 aircraft on a mixture of domestic and international routes, the latter linking Pakistani cities with a number of destinations in the Middle East. ■



Shaheen runs domestic services in Pakistan, plus international routes to the Middle East using types including the A330



**Typhoon updates:**  
BAE hints at  
production gap  
**DEFENCE P16**

**Virgin Australia has modified approach procedures into Melbourne airport**



**SAFETY**  
DAVID KAMINSKI-MORROW LONDON

## **Korean Air first to implement ROPS on A330**

**K**orean Air is to be the first carrier to implement an anti-overrun system on its Airbus A330s, after the technology secured certification on the type.

Approval from the European Aviation Safety Agency means that the runway overrun protection system – known as ROPS – is available across the airframer's range. Korean Air is to put the system into operation on A330s in service “in the coming months”, says Airbus.

The technology has been developed to reduce the risk of runway excursions.

It calculates the runway length required for a safe landing, based on aircraft and environmental conditions. If the system concludes that there is a risk of overrun, it alerts the pilots in order to give them time to consider a missed approach or other mitigating actions.

### **The technology reduces the risk of runway excursions**

The technology is already available for use on the A380 and A350, and has also been adapted for the A320 family.

Flightglobal's Ascend Fleets database records Korean Air as having ordered 30 A330s, with 22 of these examples being in the -300 variant. ■

**INVESTIGATION** ELLIS TAYLOR SINGAPORE

# **FMS altitude input error led to autopilot glideslope drift**

Boeing 777-300ER was too low on Melbourne approach after wrong entry was not noticed

**A**n erroneous height input into the flight management system (FMS) caused a Virgin Australia Boeing 777-300ER to drift below the glideslope during an approach to Melbourne airport.

The incident occurred on 15 August 2013 as the 777 (VH-VPF), was conducting a visual approach to the airport's runway 34 towards the end of a flight from Los Angeles with 272 passengers and 17 crew members on board.

Having been cleared for a standard arrival route via five waypoints, the twinjet was fully configured for final approach, with the autopilot engaged in vertical and lateral navigation modes.

After passing the final waypoint, the autopilot increased the rate of descent from around

700ft/min to 1,500ft/min. This was noticed by the first officer, who alerted the captain. However, as the captain expected it to reduce and stabilise at the anticipated rate, they agreed to continue the approach while monitoring the descent speed.

Soon after, the first officer began checking the approach to the runway visually, and advised that the aircraft was too low. In response, the captain disengaged the vertical speed mode on the autopilot and took manual control, levelling off around 500ft above ground level and turning to align with the runway.

At that point, the first officer noticed the precision approach path indicator was showing four red lights, indicating that the air-

craft was well below the glidepath. The captain subsequently flew the aircraft level until the correct profile was intercepted and conducted a normal approach and landing.

In its investigation into the incident, the Australian Transport Safety Bureau (ATSB) found that during the approach the captain had inadvertently entered the wrong runway threshold crossing altitude into the FMS.

Although this was cross-checked by a cruise first officer, this officer did not “validate” the data against the approach charts or relevant manuals.

“Although not intended as a formal validation... this was an opportunity for the error to have been identified,” the ATSB adds. ■

### **BRANDING**

## **Gol scores with revamped livery**

Brazil's Gol has revealed its revamped livery and corporate logo with the new design unveiled on the 100th 737 it has received directly from Boeing. Featuring the airline's name in bold capital letters – although retaining its trademark orange and silver colourscheme – it replaces the existing livery that has been in place for the past 14 years. It also includes a new design on the inboard face of the narrowbody's winglets.

The carrier's chief executive, Paulo Kakinoff, calls the new logo “stronger and more modern”, representing the achievements of the airline in recent years.





EQUIPMENT ARIE EGOZI TEL AVIV

## US-Iran signing prompts Israeli shopping list

Israel is preparing to deliver a list of aircraft and weapons it wants from the USA as a "compensation package" following Washington's recent agreement with Iran.

Signed in Vienna on 14 July, the pact between Iran and the USA, Europe, China and Russia sees sanctions – including those preventing the sale of commercial aircraft – lifted, in return for a halt to its nuclear weapons programme.

Israel's government has opposed the deal, claiming that it will not prevent Tehran from acquiring a nuclear capability.

Tel Aviv's new shopping list of equipment is likely to include additional Lockheed Martin F-35s, Bell Boeing V-22 Osprey tiltrotors, Boeing 767-based KC-46A tankers and munitions not previously exported by the USA.

### Already a customer for the F-35A, Israel may now be looking to firm up 17 options it has in place

Already a customer for the F-35A, Israel may now be looking to firm up the 17 options it has in place for the stealthy type. A long-sought deal to equip its air force with V-22s – which was rejected by the Israeli government last year on cost grounds – could also now be resurrected.

Washington could become "more flexible" in response to Israel's demands following the agreement with Tehran, local sources suggest. ■



Israel could ask for more F-35As



BAE Systems

Separation trials involving the Storm Shadow missile will be performed in the UK later this year

PROGRAMMES CRAIG HOYLE RAF FAIRFORD

## BAE hints at production gap as Typhoon roadmap agreed

Unpredictable export market sees Eurofighter partner companies focus on cost reduction

The Eurofighter Typhoon is poised to enter a fresh round of advanced weapons testing in the UK, as the programme's four partner nations have agreed a new long-term plan to pursue additional capability enhancements for the multi-role type.

BAE Systems will conduct additional firings of the MBDA Meteor beyond visual-range air-to-air missile from August, while Alenia Aermacchi will perform separation trials with the Storm Shadow cruise missile in September or October. BAE also will fly a developmental active electronically scanned array radar with the Typhoon during the third quarter.

The precision-guided weapons, along with the Brimstone 2 air-to-surface missile now being integrated for the UK, will "significantly enhance Typhoon", says MBDA UK managing director Dave Armstrong. The combination will be introduced by the Royal Air Force by December 2018, as part of a capability enhancement process dubbed Project Centurion.

In the meantime, its newly built Tranche 3 aircraft are being placed into storage, to save airframe life prior to receiving the modifications.

"The upgrades on the jet have been getting quicker, and cheaper," says Chris Boardman, managing director of BAE's Military Air & Information business unit. Speaking at the Royal International Air Tattoo at RAF Fairford in Gloucestershire on 17 July, he added: "It takes half the time than in 2010."

Some 436 of a contracted 571 Eurofighters have now been delivered to customer nations, with this total including 129 of an eventual 160 for the UK.

### INTERNATIONAL NEED

Noting that current commitments will sustain manufacturing until late 2017 or early 2018, Boardman says: "We need to get orders, or we won't have a production programme." But, realising that "international customers will place orders when they are ready – not according to our production continuity", he adds that the Eurofighter partner companies have adapted "to build at low rate and maintain cost". The latter has already been reduced by 20%.

However, the potential for a future production gap is being considered, and Boardman notes that BAE completed a final batch of

Panavia Tornados for Saudi Arabia three years after ending its programme for Germany, Italy and the UK, and "for a lower cost".

Also speaking at the show, Philip Dunne, minister of state for defence procurement, revealed that his counterparts from Germany, Italy and Spain have "agreed a forward capability roadmap for the next 10 years" for the Eurofighter. Finalised at a recent meeting in Barcelona, this involves their backing a "UK-defined plan", although the RAF's chief of air materiel, Air Marshal Simon Bollom, notes: "Where requirements do not cross, each nation has the possibility to go its own way."

Meanwhile, the service's deputy commander capability, Air Marshal Baz North, says there will be "absolutely no gap in capability" when its last Tornado GR4s are retired – an event expected during 2019.

"We have a Strategic Defence and Security Review that sits before us, and we are looking at things within our combat air mass," he adds. Typhoons are planned to represent 75% of this, along with the Lockheed Martin F-35B Lightning II. ■

See Show Report P18



Japan's P-1 is set  
for full capability  
SHOW REPORT P18

SYSTEMS JAMES DREW WASHINGTON DC

## U-2 adapted for USAF targeting role

Surveillance aircraft helps to re-target simulated cruise missile during tests as part of open mission system efforts

A high-flying Lockheed Martin U-2 surveillance aircraft enabled a mission control station to dynamically re-target a simulated long-range anti-ship missile during a recent trial, by using data passed from a Lockheed F-22 Raptor.

Targeting data was passed from the fighter to a ground station via an L-3 Communications modem installed on the U-2, says Scott Winstead, Lockheed's head of strategic development for the U-2 programme. This allowed operators to re-target the surrogate – essentially a cruise missile mission system being flown on a business jet.

During the tests, which were conducted in June, the U-2 was also able to translate and pass data between the F-22 and a Boeing F/A-18 Hornet. The activity was designed to evaluate new US Air Force open mission system (OMS) standards using a Skunk Works product called Enterprise OMS.

Lockheed says the U-2 testbed is on loan from the operational



Lockheed Martin

**The U-2 testbed is on loan from the air force's operational fleet**

fleet, and has been modified to comply with open standards the USAF has been developing through an "OMS consortium" of top aircraft manufacturers and suppliers. Stationed at Lockheed's Skunk Works facility in Palmdale, California, it will be returned to the operational fleet in December.

Renee Pasman, senior manager for the Lockheed open system architecture roadmap, says the pro-

gramme team was able to integrate seven OMS-compliant payloads with the U-2 in just three months, as opposed to the 12- to 24-months it normally takes to integrate a new piece of equipment with a military aircraft.

"The payloads were primarily communications payloads, for example Link 16 terminals as well as other radio equipment and some communications signals intelli-

gence payloads integrated from our industry partners," she says. "The communications payload was a fourth- to fifth-generation translator: fighter-to-fighter."

The USAF is exploring a multi-domain adaptable processing system programme that will allow new and old fighters to share battle information.

Open standards are also being developed for whichever platform replaces the air force's Northrop Grumman E-8C Joint Surveillance Target Attack Radar System (JSTARS) fleet. They could also potentially be used on the service's T-X next-generation trainer and long-range strike bomber.

Northrop also recently demonstrated compliance with OMS standards, through tests involving a B-2 bomber and NASA-operated RQ-4 Global Hawk unmanned air vehicle, in combination with a Gulfstream G550 being used as its testbed for a next-generation JSTARS aircraft. ■

**See Cover Story P34**

CONTRACTS JAMES DREW WASHINGTON DC

## Seoul turns to Lockheed for KF-16 upgrade work

Lockheed Martin and Northrop Grumman have emerged as the principle benefactors of a renegotiated South Korean KF-16 fighter upgrade, valued at \$2.7 billion.

The US Defense Security Cooperation Agency says that Seoul's second request to upgrade 134 C- and D-model KF-16s with new avionics, weapons and active electronically scanned array radars has been approved by the State Department. This comes

after an earlier effort led by BAE Systems and with Raytheon as the radar supplier was terminated because of a dispute over its cost.

A legal dispute between BAE's US business and the South Korean government continues, and further debate will be sparked as the potential \$2.7 billion price tag for the latest Foreign Military Sales programme request is about \$1 billion higher than was previously negotiated. ■



US Air Force

**BAE Systems had previously been due to perform the work**

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## RIAT 2015

Staged at RAF Fairford in Gloucestershire from 17-19 July, the Royal International Air Tattoo was a sell-out event, with almost 150,000 visitors attending. Among the 232 aircraft from 22 nations on display were a pair of Japanese P-1s visiting for the first time, while a Bristol Blenheim joined a massed flypast of Hawker Hurricanes and Supermarine Spitfires to mark the 75th anniversary of the Battle of Britain. There was also an expected farewell appearance by the Avro Vulcan XH558.

Show report by Craig Hoyle and Beth Stevenson



To find more of our coverage from this year's RIAT, go online at [flightglobal.com/defence](http://flightglobal.com/defence)



Rich Pitman

Tokyo has a current requirement for 70 of the indigenous type

### DEVELOPMENT

## Japan's P-1 is set for full capability

Kawasaki-built maritime patrol aircraft draws interest as naval operator gets set to complete operational testing

The Japan Maritime Self-Defence Force expects its Kawasaki Heavy Industries P-1 maritime patrol aircraft to reach full operational capability by September.

Vice Adm Makoto Sato, commander of the service's fleet air force, says the type is nearing the end of operational testing, all of which is on track to be completed by the target date.

The four-engined P-1 was first integrated with maritime squadrons flying the Lockheed Martin P-3 Orion – the aircraft that the new design is replacing – in March. The two aircraft that were deployed to the show were subsequently flown to Djibouti, where they were to carry out operational testing in tropical conditions. Tokyo has deployed P-3s to the African country since 2009 in support of multinational

counter-piracy operations.

Meanwhile, with the UK currently having a maritime patrol aircraft capability gap, Kawasaki is believed to be ready to offer the P-1, should a formal requirement emerge.

Interest in the P-1 is high due to its international debut at RIAT, but Sato says an exchange with UK personnel is not in the pipeline.

"We don't have that planned, but in the future – if agreeable – we would consider it," he says. However, he notes: "we have only just started operations, so the Japan Maritime Self-Defence Force needs to reach full operational capability first."

The Japanese service has so far had 10 P-1s delivered, all of which are assigned to its Atsugi air base. Its total requirement is for 70 of the type, Sato says. ■

Craig Hoyle/FlightGlobal



### TRAINING

## RAF extending Seedcorn to retain specialist skills

Royal Air Force crews are to continue working with units in Australia, Canada, New Zealand and the USA for another three years under an extension to the UK's Project Seedcorn initiative to maintain skills in operating maritime patrol aircraft. These include the ability to conduct anti-submarine and anti-surface warfare and intelligence, surveillance and reconnaissance tasks.

Seedcorn crews are integrated into test and evaluation squadrons

such as the US Navy's VX-1 at NAS Patuxent River in Maryland, where they are gaining experience on the Boeing P-8 Poseidon.

The 737-derived P-8 is thought to be at the top of the Ministry of Defence's shopping list as a replacement for its cancelled BAE Systems Nimrod MRA4s. Twenty of the UK's 32 Seedcorn personnel are assigned to the type, and an example from NAS Jacksonville in Florida was in the static display at the show. ■



Craig Hoyle/FlightGlobal

### SURVEILLANCE

## Boeing shows Poseidon alternative

Boeing sent its Bombardier Challenger 604-based maritime surveillance aircraft (MSA) to the show before going on to conduct a demonstration for a potential customer in Finland.

Proposed as a lower-cost alternative to the company's own P-8 Poseidon, the MSA lacks armaments or the ability to deploy sonobuoys.

The current experimental aircraft – registered N614BA – is representative of a proposed production configuration, which would use either the Challenger 605 or 650 platforms, converted by Canada's Field Aviation.



Russian oil giant  
Rosneft takes  
stake in HeliVert  
ROTORCRAFT P20

TRANSPORTS

# Latest Voyager keeps military mission

Newest 'surge-fleet' aircraft will support RAF's core inventory of the type, rather than being offered for commercial use

**A**irTanker is offering its latest Airbus A330 Voyager – acquired as part of the UK's Future Strategic Tanker Aircraft programme – to enable military operators to move personnel or freight, rather than put the widebody into commercial use.

The 12th of an eventual 14 Voyagers is part of a so-called "surge" fleet to be made available to the UK if required beyond a core inventory of eight flown by the Royal Air Force and a ninth that is retained on the civil aircraft register and flown by AirTanker crews.

"We believe there's value for our UK customers in making this aircraft available to them," says AirTanker chief executive Phill Blundell. "It would be cheaper to use Voyager than going to the charter sector."

For now, the company will employ KC2-model aircraft



Craig Whyte/Flightglobal

**AirTanker says additional UK use would reduce charter spending**

ZZ341 to support its existing tasks, but Blundell notes: "If there's no interest it would be available for the next civilian summer season."

Longer-term, AirTanker hopes to provide excess capacity to support a European Defence Agency (EDA) initiative to acquire a fleet

of A330 tanker/transport for pooled use by the Netherlands, Norway and Poland, for example by supporting personnel training.

"We can get them very familiar with the platform," says Blundell, who says discussions with the EDA have the support of the RAF and Airbus Defence & Space.

Meanwhile, an A330-200 operated by Thomas Cook Airlines since 1 May under a lease agreement with AirTanker has been returned to its facilities at RAF Brize Norton in Oxfordshire for adaptation to the carrier's 323-seat, all-economy class configuration, as its Acro-supplied replacements were not available in time for its introduction.

The programme's first "surge" aircraft had flown more than 23,700 passengers before being returned for the work, which should take around three weeks to complete.

AirTanker's remaining two Voyagers are scheduled for receipt in January and September 2016. The type has just received final operational clearance to provide in-flight refuelling to the RAF's Boeing E-3D Sentry airborne warning and control system aircraft, Blundell says. ■

SURVEILLANCE

# Scorpion shines during Royal Navy demonstration

**T**extron AirLand has detailed its demonstration flights performed in support of the UK Royal Navy using its Scorpion light strike and surveillance aircraft.

During around eight flights, the Scorpion was tasked with inspecting maritime surface contacts by observers aboard a Westland Sea King 7 airborne surveillance and control helicopter from 849 NAS, based at Culdrose in Cornwall.

"Royal Navy crews were able to use the Scorpion for valuable controller experience, while Textron was able to put the recently integrated Thales I-Master [synthetic aperture] radar through its paces in a maritime environment," the US company says. The aircraft's L-3 Wescam MX-15 electro-optical/infrared sensor was also employed.

With a typical endurance of 3.5h, the flights were staged from

the Ministry of Defence's Boscombe Down site in Wiltshire, from where six staff pilots from the Empire Test Pilots' School also flew the type.

The Scorpion team had remained in Europe following their participation at June's Paris air show, also supporting demonstrations in Bulgaria and Romania.

Referring to the Scorpion's high reliability rate, Textron AirLand chief test pilot Dan Hinson says: "We've only put gas in since we left Kansas", with "zero unscheduled maintenance" required. A total of 451 flight hours had been accumulated using N531TA prior to its departure from the UK on 20 July, with 39h logged since it visited Le Bourget.

Other recent enhancements have included the fitment of an airbrake and improved anti-skid braking capability, plus anti-icing system equipment, Hinson says.



Lloyd Hogan/Textron AirLand

**The aircraft was tasked by the crew of a Sea King ASaC 7**

In the rear cockpit, a single-panel, 15in-wide multifunction display and stowable keyboard has been installed for the sensor operator.

"We're looking for legitimate ISTAR [intelligence, surveillance, target acquisition and reconnaissance] capability," says Hinson. "We needed a display to show it."

A new version of the Scorpion is due to be rolled out in the second quarter of 2016, with modifications including trimmable horizontal

stabilisers, a trailing link main undercarriage and slightly rounder engine intakes. The aircraft's wing also has been swept back by a further 4°, and a wider nose will enable an air-to-air radar to be fitted, along with a weather radar.

Hinson says the programme's first aircraft will continue to support mission system and weapons testing; the latter of which will commence later this year with loading and flight trials. ■



PROPOSITION DOMINIC PERRY LONDON

# Turbomeca pitches Arrius to power ahead of PW206

French engine manufacturer believes latest iteration of turboshaft will take share from rival

French rotorcraft engine manufacturer Turbomeca believes its Arrius 2B2+ powerplant is poised to aggressively take market share from rival Pratt & Whitney Canada's PW206B2 turboshaft on the Airbus Helicopters H135.

Historically the two have split the market fairly evenly on the light-twin platform. However, last year Turbomeca claimed around 56% of deliveries and it believes it can far exceed that figure in future.

"With the efforts we are putting in we are clearly targeting something like 70% within a two-year timeframe," says Jean-François Sauer, vice-president Arrius and Arriel programmes at the Bordes-based company.

He points to the recent defection of Norwegian emergency medical services operator Norsk Luftambulanse away from P&WC for an initial three examples of the H135.

Its existing fleet of 12 H135s are all equipped with P&WC engines,



Norsk Luftambulanse's current H135 fleet use P&WC engines

and Sauer hopes that the switch will see it win the engine selection on Norsk Luftambulanse's remaining 11 optioned H135s.

Sauer believes that three factors are in its favour. First, as was the case with Norsk Luftambulanse, it is able to offer a combined support package for the Arriel 2E engines that power the larger H145.

Turbomeca has also been conducting a complete overhaul of its maintenance offering as a response to poor customer feedback.

"Turbomeca was not really famous for its support," says Sauer.

"But we have put huge efforts into improving this and people are considering us again."

In addition, the 2B2+ provides a 6% power improvement over the previous iteration of the Arrius, says Sauer.

Meanwhile, Turbomeca is poised to begin delivering the first serial Arrius 2R engines to Bell Helicopter for its 505 Jet Ranger X.

That milestone is scheduled to take place in the second half of August, says Sauer, with 15 units of the 504shp (376kW) turboshaft to arrive at Bell's new Lafayette, Louisiana assembly line this year.

Ramp-up on the programme is aggressive: by 2018 Turbomeca will be producing around 200 Arrius 2Rs per year, says Sauer.

In fact, combined with variants of the same model supplied for other rotorcraft – around 50-70 per year will be accounted for by the 2B2+ – by the end of the decade Turbomeca will be building as many as 300 Arrius engines per year, he says. ■

PRODUCTION

## Airbus wins first customer for its US-built H125

The Ohio State Highway Patrol (OHSP) will later this year take delivery of the first H125 to be produced on Airbus Helicopters' assembly line in Columbus, Mississippi.

Airbus Helicopters had previously used the facility to build UH-72A Lakotas for the US Army, but in late 2013 it announced that it would add the light single-engined H125 to the plant's output in order to cut lead times.

Production of the H125 – formerly the AS350 B3e – began at Columbus near the end of 2014.

Delivery and service entry for OHSP's Turbomeca Arriel 2D-powered helicopter will take place later this year.

Already operating a pair of AS350 B2s, OHSP is eager to get its hands on the latest variant, says Capt Randy Boggs of the force's aviation section. "Our new H125 will give us increased power and useful load, along with additional safety features. We are looking forward to placing our new helicopter into service later this year." ■

JOINT-VENTURE DOMINIC PERRY LONDON

# Russian oil giant Rosneft takes stake in HeliVert

AgustaWestland is to restructure the ownership of its Russian joint venture HeliVert, with Moscow-based oil firm Rosneft taking a 30% stake in the business, formerly a 50:50 tie-up with Russian Helicopters.

Rosneft will acquire 20% of the company from the latter, with the remaining 10% relinquished by AgustaWestland.

The details of the pact emerged as RN-Aircraft, a subsidiary of Rosneft, placed a firm order worth €160 million (\$173 million) for 10 AW189s. These will be assembled at the HeliVert facility in Tomilino, near Moscow. Deliveries will run from 2015 to 2017.

It is the first firm order to emerge from a framework agreement the oil giant signed with AgustaWestland last year, covering the acquisition of as many as 160 examples of the 8.3t rotorcraft in the period to 2025.

AgustaWestland gave few details on the reasons for the change in ownership, save for saying that the move will "strengthen its industrial collaboration with its Russian partners".

It declines to comment on what Rosneft has paid for the 30% stake.

HeliVert has since June 2012 been assembling the smaller AW139 for the Russian and CIS markets, with first flight of a



AW139s have been assembled by HeliVert for the local market

Russian-built example taking place in December that year.

Production capacity is 20 helicopters per year, however, sales appear to have been under-

whelming, with only a handful so far delivered. Nonetheless, AgustaWestland says the AW139 line will be maintained in parallel with AW189 assembly. ■

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## OSHKOSH 2015

Part industry gathering, part camp-out, there is still nothing on the aerospace calendar quite like the annual Experimental Aircraft Association's AirVenture show in Oshkosh, Wisconsin. The number of general aviation pilots is falling as the price of new aircraft is increasing, but the industry is fighting back. Hopes are rising about a regulatory re-write that seems perennially "two years away", but new options are appearing on the market, such as remanufactured piston aircraft and new light sport designs. Stephen Trimble reports.

Photography by Jeremy Dwyer-Lindgren



### LOW-COST AIRCRAFT

## Remanufactured pistons could soar

The latest programme to build old Cessnas reflects a rising interest in the concept, with other airframes under consideration

**A** newly-launched programme to remanufacture 35 to 40-year-old Cessna 172s could spread to several other piston aircraft models, offering buyers a relatively low-cost option to buying a new aircraft.

Wichita-based Yingling Aviation chief executive Lynn Nichols announced on 21 July that the company has accepted a proposal by the Aircraft Owners and Pilots Association (AOPA) to begin remanufacturing Cessna 172 Skyhawks.

The start of the programme comes a year after AOPA's "Re-imagined" initiative prompted Aviat to launch a remanufactur-

ing programme for the two-seat Cessna 152.

AOPA and Yingling are already in discussions about launching similar remanufacturing programmes for the Cessna 182, Cessna 210, Beechcraft Bonanza and Piper types, Nichols says. In the near-term, however, Yingling is focused on making the Cessna 172 manufacturing successful.

### LONG WAIT

The follow-on programmes are "way out there" on the distant horizon, he says.

But Nichols is clearly encouraged by the immediate response from the market about

the remanufactured "Ascend 172", he says.

One day after launching the programme at AirVenture, the response from potential customers had "exceeded all of my expectations", Nichols says.

He acknowledges that Yingling embarked on the programme with some doubts. After being approached by AOPA to consider launching such a programme, Nichols assigned his department heads to evaluate if it was feasible to offer a remanufactured Skyhawk at a price point of \$150,000. After several weeks of analysis, the department heads

came back with a price that "blew by" that threshold, Nichols says.

### SINGLE IDEA

But Nichols detected a flaw in the team's pricing model: the analysis was based on a one-off project for a single aircraft. Nichols told them to assume a serial production run and re-calculate the analysis. The result was more encouraging. The team still could not hit the \$150,000 target, but a basic, visual flight rules version of the Ascend 172 is now costed at \$159,000.

The new price "was close enough," Nichols says. "I thought, you know, we'll still get more efficiencies, and ring the costs out."

Though known mainly as a general aviation maintenance services and parts distributor, Yingling has experience with aircraft modifications. Freight specialist FedEx selected Yingling to modify a fleet of 250 Cessna Caravan single-engined turboprops with new de-icing equipment. That experience led Yingling to develop a specialised production system for modifying existing aircraft, Nichols says.

"We're taking what we learned from the Caravan programme over to this," Nichols says. "We're going to see if it works. I can't tell you it's perfect, but we're off to a start." ■



Interest in the Cessna 172 has prompted further talks between AOPA and Yingling on other aircraft



**DEVELOPMENT**

# Icon finally ready to spread the fun

US firm is making first deliveries of its recreation-focused A5, and promising an “inspirational” mix of safety and style

After nine years, a major redesign and a lot of patience, Icon Aircraft finally began making aircraft deliveries on 20 July with a donation – worth \$239,000 – of the first A5 light sport amphibian to a US youth group called the Young Eagles.

The long-awaited delivery comes a month after Icon passed a US Federal Aviation Administration audit of the company's current production facility in Tehachapi, California, which allowed the start-up to receive a special-light sport aircraft (S-LSA) certificate for the A5.

Icon launched the project in 2006 with the bold promise to not only deliver a new product, but to re-energise the general aviation industry. Emphasising safety, easiness, fun, versatility and style as design goals and originally a very low, \$139,000 price point, Icon's flashy marketing approach always stood out among its peers in the general aviation industry.

“We believe that flying is like the ultimate metaphor for human freedom,” says Icon chief executive Kirk Hawkins. “It has nothing to do with transportation, and it has everything to do with inspiration.”

## **SAFETY FIRST**

Two common design goals not on Hawkins' list for the A5 – speed and range – are intentional. The A5 is intended to be used mainly for recreation, not utility. Above all, Icon's recreational vehicle must be very safe: the targeted market for the A5 is a casual flier, perhaps transitioning from a speedboat or a racing car.

That design criteria led Icon to incorporate several unusual features for a general aviation aircraft, including an angle of attack indicator in the cockpit and a spin-resistant wing. Both features are aimed at preventing the conditions that lead to the number one killer for general aviation pilots: loss-of-control at slow speeds.



Icon Aircraft

**Style was a key consideration in development of the A5, backed up by Icon's flashy marketing efforts**

A flight demonstration provided for a Flightglobal journalist over Lake Winnebago in Wisconsin suggests that Icon's safety-related features work as intended.

At 1,000ft, the pilot, Icon vice-president of sales Craig Bowers, slowed the A5 to about 45kt (83km/h), or about 5kt below stall speed, and pitched the nose up slightly. The angle of attack indicator flashed from green to red, just as a sharp buffet developed. With the stick pulled to the backstop, Bowers shifted the ailerons to the left and – in a seemingly suicidal move – applied right full rudder. Instead of entering an unrecoverable spin, the A5 instead remained in controlled flight, although sinking in stall at a rate of 1,000ft/min.

As brash as Bowers' manoeuvre seemed, he was not relying solely on the aircraft's aerodynamic characteristics. The wing is spin-resistant, but not foolproof. If somehow the aircraft entered a spin, Bowers would deploy a nose-mounted ballistic parachute, which would deposit the A5 onto the water at 1,500ft/min.

## **COMPLEX DEMANDS**

Such safety-inspired protections can seldom be found in general aviation outside the LSA category, a phenomenon some assign to the complexity of more advanced certification standards, such as Part 23.

Former Cessna chief executive Jack Pelton, who now leads the Experimental Aircraft Asso-

ciation, finds that situation “embarrassing”.

The A5 amphibian is officially now in the S-LSA world, where the industry will closely monitor its sales progress.

Despite the programme's many delays, Icon claims to have a sold-out order backlog for the first three years of production. The company plans to deliver 35-40 A5s over the next 12 months, 100 aircraft over the next 18 months, and 600 aircraft after 30 months.

The \$239,000 price tag applies to the first 100 aircraft off the assembly line. Subsequent aircraft pricing is expected to decline to under \$200,000. That is still far above Icon's initial projection under \$140,000 and makes it among the more costly aircraft occupying the light sport category.

“There's no plan right now for a Part 23 variant. But that's not to say in the future, you know, if the rewrite brought it closer to the [consensus-based LSA standards], then one could logically assume that it might make sense to start looking at that,” Bowers says. “I'm not trying to be cagey. There is nothing there right now. But if you connect those dots, it's actually a pretty compelling picture.” ■



**The aircraft's capabilities were demonstrated by Icon at the show**



## ELECTRIC AIRCRAFT

# Terrafugia unveils TF-X concept windtunnel model

Terrafugia unveiled at the show a newly moulded windtunnel model for a hybrid-electric, stop-fold tiltprop concept.

The model, presented under glass at the Terrafugia exhibit, is the first tangible product of the TF-X concept programme, which was launched two years ago as a 10-year-plus development project.

Terrafugia also released a new promotional animation showing how the T-FX would operate. The electric-powered propellers tilt 90° for a vertical take-off. In transition to forward flight, the propellers rotate until parallel with the fuselage. As a rear-mounted ducted fan is activated, they stop spinning and fold back along the nacelles.

"This is why it's going to be all computer-controlled," says Richard Gersh, Terrafugia vice-president of risk management.



The concept would be highly autonomous but have an override

"There's no way that somebody is going to [control] that."

The T-FX concept envisages a highly autonomous control system with a manual override available. Terrafugia's vision is to require no pilot license to fly the aircraft but an operator certificate to use the manual over-

ride system, Gersh says.

The electric propulsion for the aircraft would be supplied by batteries, but the power level needed exceeds anything available today. "Batteries are a problem for everyone," he says.

The power source for the ducted fan has not yet been selected,

but it could be a turbine or gas-driven piston engine, Gersh says.

Meanwhile, the company is still working to certificate the Transition roadable aircraft, which it originally expected to do this year, Terrafugia now plans to begin deliveries in 2017, Gersh says. The unit price could rise into the "low \$300,000s" after the first 10 deliveries, he adds.

Parts for the third-generation version of the Transition vehicle are now being produced.

Terrafugia is waiting for the US Federal Aviation Administration to decide on a petition for a weight exemption. The FAA has approved a special weight category under the light sport aircraft rule, allowing roadable aircraft up to 762kg (1,680lb). But the Transition's maximum take-off weight has grown to 816kg. ■

## ASSESSMENT

# Tecnam evaluates two-seat trainer

Italy-based company says the fledgling programme came about after it was approached by two military organisations

An approach by two military organisations drove Tecnam to launch an evaluation of a two-seat, single-engined jet aircraft for the trainer market, says director of US sales Shannon Yeager.

Tecnam has signed non-disclosure agreements with the militaries involved in the P-Jet project, so it cannot yet reveal their identities. Yeager says only that neither is American.

The Italian general aviation manufacturer launched initial conceptual studies in May. Those should be followed in 2016 by the launch of a design criteria phase, Yeager says. A formal schedule has not been released, but Tecnam generally delivers a new aircraft about 3.5 years from programme launch, he says.

A concept drawing shows a small turbofan engine mounted on a pod atop the fuselage between the canopy and a twin-tail vertical stabiliser.

The podded engine configuration is so far the only detail about the propulsion system that has been decided, Yeager says. Tecnam is still evaluating requirements for thrust, weight and specific fuel consumption, he adds.

A civilian version of the aircraft is expected to follow introduction of the military trainer.

Pressurised and unpressurised versions are planned. ■



A top-mounted engine pod could house a turbofan, as depicted

Jeremy Dwyer-Lindgren

## PROMOTION

# Deposits taken as P2010 US sales pitch begins in earnest

Tecnam began the US sales campaign for its P2010, taking 10% deposits on the \$345,000 aircraft.

The expected type certification approval from the US Federal Aviation Administration seems routine, as Tecnam has delivered 25 of the four-seat, high-winged single-pistons in Europe under a European Aviation Safety Agency validation.

But the FAA's approval could be semi-historic. According to Tecnam US sales director Shannon Yeager's research, the P2010 will be the first clean-sheet, high-winged aircraft certificated under Part 23 of the Federal Aviation Regulations in 48 years, when the Cessna 177 Cardinal was first approved.

Other high-winged general aircraft

have appeared during the last half-century, but the P2010 could become the first to make it through the Part 23 certification process, Yeager says. Tecnam plans to assemble P2010s delivered to US customers at a new factory in Sebring, Florida, but in the near term can still ramp up deliveries by leveraging an already active production line in Italy. ■



PERSONAL JET

# Cirrus says SF50 on target, but sounds note of caution

Static testing is up next, as the airframer draws on experience from certification of SR22

The Cirrus Vision SF50 is entering the final stretch of a nearly two-year certification campaign, with company officials encouraged by performance so far, but cautious about the chances of the jet remaining on schedule.

Officially, the single-engined, V-tailed jet, launched by Cirrus nine years ago, is still running on track to receive type certification from the US Federal Aviation Administration by the end of the year, says Pat Waddick, president of innovation and operations.

But past experience certifying the piston-powered SR22 provides a cautionary note.

"I've seen all sorts of things come up where you've got to work through issues," Waddick says.

So far, the three production-conforming SF50 flight test aircraft have completed a package of flight performance testing, including stalls, spins and manoeuvrability, Waddick continues.

The flight test fleet has also completed certification tests showing the SF50 can fly normally with ice shapes attached to the fuselage, he says.

The next step is static testing, to prove that the airframe can survive a 12,000h design life.



Test aircraft have completed a package of flight performance trials

Then comes one of the most challenging tests in the certification programme: in-flight deployments of a ballistic aircraft parachute system.

Cirrus pioneered the integration of a ballistic-deployed parachute system behind the cockpit of the SR22, with 53 deployments to date saving 107 people.

With a jet engine occupying the same space in the SF50, Cirrus' newest aircraft instead has the parachute system installed in the nose. That configuration – occupying a sensitive area for balance and centre of gravity – forced Cirrus to adopt the parachute as a required standard item.

"We had a fork in the road and

we had to choose one or the other and because of our passion for safety we chose to have it," Waddick says.

So far, Cirrus has performed a progressive series of certification tests on the parachute, including an ultimate load test involving a simulated aircraft deployment.

By mid-September or early October, the company expects to perform in-flight parachute deployments for the first time. "Those are tests that get your attention because it's one of the higher risk tests that we run," Waddick says.

Meanwhile, another production conforming aircraft must begin a 150-200h series of function and reliability testing, he says. ■

CERTIFICATION

# Piper opts for M600 breathing space

Piper will slightly delay receiving certification of the six-seat M600 from the US Federal Aviation Administration to the first quarter of 2016.

An earlier plan to receive a type certificate for the single-engined turboprop by the end of the year would have omitted flight into known icing, but the new schedule allows the Florida-based manufacturer to begin deliveries with a fully capable M600 early next year, says Piper

chief executive Simon Caldecott.

Piper is now in discussions with the FAA to scope out the flight test programme for the



The type was on static display

M600, a clean-sheet design unveiled last April.

The slight delay comes a week after Piper announced a lay-off of up to 150 employees at its Vero Beach, Florida headquarters.

The lay-off was due to slower economic activity in Asia, parts of Europe and North America, Caldecott says.

"We expected sales to increase in the summer, but have yet to see demand come back at the pace we had planned for." ■

DIESEL AIRCRAFT

# Revived Mooney makes progress with M10 trials

Mooney plans to certificate the three-seat M10 piston single in 2017, releasing its first new aircraft to market since new Chinese owners revived the Texas manufacturer in 2014.

The company first unveiled the diesel-powered M10T and the speedier M10J at last year's air show China in Zhuhai.

Mooney last week completed a one-month series of wind-tunnel tests on a one-fifth scale model at Wichita State University, says chief executive Jerry Chen, adding the results were "satisfactory".

The airframer is now building a proof-of-concept aircraft at a new research and development facility in Chino, California. It should fly within the next several weeks, helping the company to transition into certification testing with the US Federal Aviation Administration next year.

Mooney plans to undertake low-rate production of the M10 series in Chino while the company builds a permanent production facility at its traditional home in Kerrville, Texas. Another factory will be built in China to service demand from Asian customers, Chen says.

The development activity underscores Mooney's remarkable revitalisation within the last 18 months.

By the end of 2013, Mooney's historic Kerrville plant had been shut down for five years, with only nine employees remaining on the payroll. An acquisition by a Chinese real estate company in October 2013, however, revived the company.

The restarted assembly line in Texas has delivered at least 11 new M20s that were built from scratch, rather than re-assembled from parts already in assembly before the plant was shut down.

More than 170 employees work for Mooney, including 70 workers newly employed in Chino. "We are moving full speed ahead to a new direction," Chen says. ■



Debris from the Germanwings A320 crash

# PERCEPTION PROBLEMS

Fatal accident figures are still low, but unusual disasters have negatively affected views on air travel safety, in part due to the increasingly rapid dissemination of information

DAVID LEAROUNT LONDON

The last 18 months have changed perceptions of air traveller safety. The good news is that there continue to be very few serious fatal airline accidents, but that has been offset by three disastrous events that were not accidental.

Another factor affecting public perception is the development of far more rapid dissemination to the media of information about the losses.

Within almost exactly a year of the loss of Malaysia Airlines flight MH370 – still a mystery – the travelling public was subjected to another strange airliner loss: that of the Germanwings Airbus A320 in the French Alps.

Not only did the A320 crash in unusual circumstances, but almost immediately after it went down, reliable detail based at first on commercial flight tracking information available on the web, and then on facts from the flight data and voice recorders, was quickly broadcast around the world. The co-pilot had apparently deliberately crashed the aircraft with 150 souls on it, the public were told.

The agency for the public release of recorded data about the Germanwings loss was the French prosecutor responsible for the case, who delivered the information directly to television cameras near the impact site. His data source was the French accident investigator, the BEA. In France a judicial prosecutor works in parallel with the technical accident investigators. The cockpit voice recorder (CVR) was found within 48h, and it was on the basis of CVR and air traffic control radar data that the verdict was delivered. The flight data recorder (FDR) was not found for another week, but when it was, the information backed up the inferences from the CVR.

## COMPREHENSION ISSUES

The result of the rapid disclosure of data was that the public quickly became remarkably well-informed about the crash, although they – and even the media themselves – struggled to comprehend the event's significance for air travel, especially following the MH370 disappearance a year before. Four months later, Malaysia Airlines flight MH17 – a Boeing 777 – was shot down over eastern Ukraine, and

## ANALYSIS

### ACCIDENT REPORTS RELEASED SO FAR THIS YEAR

AIRLINE ACCIDENT reports, either final or interim, published by investigators during the first six months of 2015:

#### National Airlines Bagram air base, Afghanistan, April 2013

The US National Transportation Safety Board has reported that a military vehicle carried in a National Airlines Boeing 747-400F "most likely" broke free from restraints during the take-off rotation at Bagram air base, Afghanistan, rolled aft and punctured the aft pressure bulkhead, damaging control systems moments before the

aircraft pitched up unsustainably and crashed.

The agency believes that factors in addition to a shift in the aircraft's centre of gravity contributed to the aircraft's loss of control. These NTSB and Boeing findings were made available in advance of the final report.

The 747-400 converted freighter (N949CA) crashed on 29 April 2013 shortly after take-off on a flight to Dubai, killing all seven crewmembers.

Video from a passing ground vehicle's dash camera shows the aircraft pitching steeply nose-up

shortly after take-off, then rolling right, falling and exploding on impact with the ground.

Documents from the NTSB and a report from Boeing, which examined the flight data recorder at Afghanistan's request, show that the cargo consisted of five MRAP (mine-resistant ambush protected) armoured military vehicles. The aircraft was loaded at Camp Bastion and made a fuel stop at Bagram en route to Dubai.

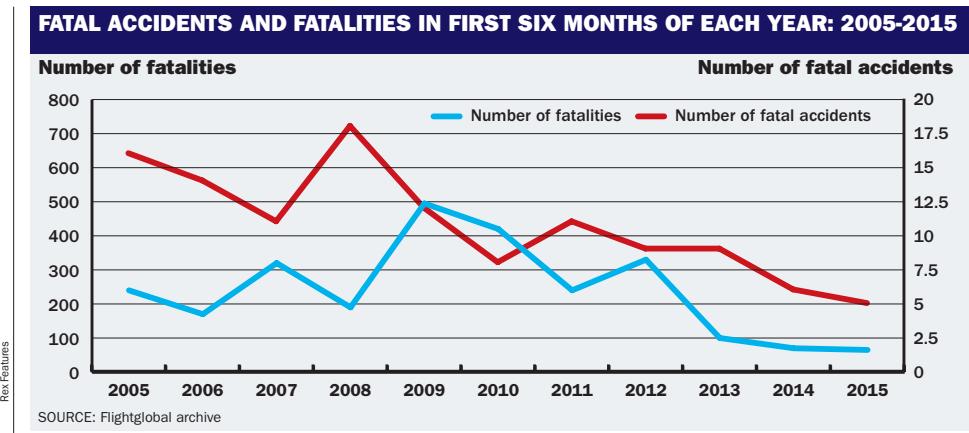
The reports note that shortly before take-off the pilots discussed that one of the straps had broken and one of the vehicles had shifted

**Boeing notes that the FDR stopped working when the aircraft was just 33ft off the ground**

"a couple inches" during the previous flight. The vehicles could not be driven on to the aircraft, so technicians loaded them on pallets. The 12t vehicles were loaded on single pallets, while the 18t vehicles were loaded on a "double pallet", which was constructed from



Rescue workers at the TransAsia crash site



suddenly air travel stopped feeling as reliable and safe as it had done, despite the fact that statistics for actual accidents continued to show safety was steadily improving against figures that were already the best in aviation's history.

In the light of all this, what of the first six months of 2015? There have been six fatal airline crashes, one of them the Germanwings loss, but five of them accidents, according to the traditional definition of that word.

In the five fatal accidents this year, 65 people died, while another 150 were killed in the Germanwings aircraft. This bears comparison with the first six months of 2014, where there were five fatal accidents causing 28 deaths, plus the enigmatic disappearance of MH370 in which 239 people were lost.

There are other parallels between the first half of this year and the same six months in 2014. In both years there were no accidents involving jets, and all the aircraft that did crash were small and carrying few people. The one exception to that description occurred this year when a TransAsia ATR 72-600 carrying 58 people crashed, killing 43 of them. That single accident accounted for

most of the difference between the fatality totals in the two years despite the number of fatal accidents being the same.

The TransAsia crash this year – for which the FDR and CVR information was also rapidly made public – reinforced a powerful and growing regional perception of an apparent safety collapse among Asian carriers. This perception had been slowly building within the Asia-Pacific media since MH370 went missing in March 2014. Then in July 2014 there was the MH17 shoot-down and, a few days later, a TransAsia ATR 72 crashed on approach to Makung in Taiwan's Penghu Islands, killing 48 people. When that was fol-

lowed by the December 2014 crash of an Indonesia AirAsia A320 in the Java Sea killing all 162 people on board, the region's media started asking questions of expert commentators that revealed genuine nervousness about the safety of local airlines. Then in February this year, just as the media were beginning to calm down, TransAsia had its second fatal ATR 72 crash in six months.

#### OPEN INVESTIGATIONS

It is a moot point whether perceptions rather than reality should be the subject of this analysis, and whether perceptions have any bearing on safety for the future. But not only are accident investigations becoming more open, the effects of social media cannot be ignored. A Flightglobal analysis of the effects of social media in February observed: "The digital might of ordinary citizens now has the power to bury the brand image of an airline in the seconds it takes for 140 tweeted characters to go viral."

So perceptions of airline safety combined with investigatory openness and citizen journalism/social media have the power to put pressure on airlines to be highly safety-aware, and to



Footage of the ATR crash spread quickly

two pallets with plywood between them to reduce friction, documents say. The pallets were secured to the 747's deck using "dozens" of 5,000lb straps.

Boeing's report says: "Data and physical evidence... indicate that the most likely scenario involved at least one MRAP (aft-most) breaking loose of its restraints shortly after take-off rotation, shifting aft and damaging the FDR/CVR [flight data recorder/cockpit voice recorder], before penetrating the aft pressure bulkhead."

The company notes that the FDR, which is installed just forward of the

aft pressure bulkhead, stopped working when the aircraft was just 33ft off the ground.

That finding is consistent with another NTSB document noting that crash investigators found streaks of the FDR's orange paint on the rear-most vehicle, and an imprint of that vehicle's rear spare tyre on the aft-pressure bulkhead.

The investigation also found aircraft parts, including those related to hydraulic systems, on the runway and ground along the aircraft's flight path, suggesting the vehicle damaged the aircraft's control systems.

"The MRAP's aft movement com-

promised at least hydraulic systems number one and number two and may have contacted the stabiliser jackscrew actuator assembly, shearing the jackscrew actuator from its fuselage attach points," says Boeing's report. "If the stabiliser jackscrew actuator had been liberated from its attach points on the fuselage by the MRAP, the horizontal stabiliser control system would most likely have been compromised to the point that continued safe flight and landing would not have been possible."

The report adds, however, that loss of FDR data makes it impos-

sible to determine the cause with absolute certainty.

#### UPS Birmingham, Alabama, August 2013

Following publication of findings on the August 2013 UPS Airbus A300-600 freighter crash in Alabama, the US Federal Aviation Administration advised all operators to ensure they have the latest software updates for enhanced ground-proximity warning systems.

Although the freighter, which struck terrain while attempting to land at Birmingham, Alabama, had been fitted with an approved

CONTINUED

## ACCIDENT REPORTS RELEASED SO FAR THIS YEAR

» Honeywell warning system, it did not feature the most recent available software. The bulletin states that if the software had been updated, the aircraft would have entered the terrain alert envelope about 200ft above the ground, some 1.3nm from the runway threshold.

As it was, the crew of the A300 received a “sink rate” warning about 8s before an initial collision with trees, with a “too low, terrain” alert sounding just after that impact.

In the special bulletin dated 13 March 2015 the FAA states that the latest software would have provided a “too low, terrain” alert some 6.5s earlier, when the aircraft was 150ft higher”, explaining: “Although it is not clear if the later version of the software would have prevented the accident, it would



**The A300-600 freighter struck terrain while attempting to land**

have provided a significantly improved margin of safety.”

The bulletin, which has also been highlighted by the European Aviation Safety Agency, has not been elevated to a formal airworthiness directive. NTSB investigators pointed out

that the A300’s high descent rate would nevertheless have “compromised” the effectiveness of the warning system, even with the updated software.

But their analysis of the crash determined that an immediate acti-

vation of the go-around switch, or an aggressive manual response to the terrain alert, would have enabled the aircraft to avoid the impact.

**SCAT Almaty, Kazakhstan, January 2013**

Investigators have been unable to determine why a Kazakh Bombardier CRJ200 operated by SCAT crashed while attempting a go-around at Almaty two years ago, with the loss of all 21 on board.

Analysis of the aircraft’s dynamics shows that, instead of climbing away from the abandoned approach to runway 23R, it dived from a height of about 150m (500ft), striking the ground and disintegrating.

“It has not been possible to clearly identify the reason for the aircraft’s transition to a dive – instead of a climb – from the available

» persuade all except the smallest operators to have a crisis communications setup. It has been difficult for some time to work out why safety statistics, already outstanding, keep getting better, but this kind of pressure on airline boards may be one of the factors.

Meanwhile, it used to be true that the industry learned about accidents by having them and then analysing them. Now that only a few accidents happen – and they hardly ever affect big jets or major carriers – where is the future’s safety wisdom to come from? And equally importantly, how will the industry maintain consciousness of continuing risk? The risk of complacency must surely be high when everything seems to be going well.

Conventional wisdom says incidents and good reporting systems – encouraged by a just culture – are the answer, because they hold

the clues to areas of risk. And if today’s accidents rarely involve a hull loss or fatalities, what do they involve? Are they trivia that could safely be written off?

**WEATHER CONDITIONS**

The clues are in the non-fatal section of the accident list. It is clear from the list that airlines should work out how to prevent approaches that end in damaging hard landings or expensive tail-scratches, and runway excursions on landing. These are often, but not always, associated with difficult weather conditions like windshear.

Runway excursions may usually be non-fatal and do not usually involve a total hull loss, but they are the industry’s biggest single risk and constitute a huge expense. But despite a growing awareness of this risk since

the Flight Safety Foundation began a campaign to raise its profile almost a decade ago, hard landings and runway excursions do not appear to be diminishing. Also, it is an accident category that still affects the big carriers and big jets as well as the commuters. If the industry could find a solution – or at least a mitigation – to runway excursions, it would reduce risks and costs massively.

Airlines have been working on solving the problem by improving crew discipline to ensure stabilised approaches. But this list suggests a study specifically of crews’ responses to weather conditions and windshear at landing would be useful.

These days an aircraft’s type or design is rarely cited as an accident cause or contributor, but occasionally accidents occur that make it look as if this might have been a factor, even if it turns out to be coincidence. For example, if the two fatal accidents this year to non-passenger flights (see *accident list*) both involved Swearingen Metros, and both carried out remarkably similar short flight profiles after take-off before diving to earth. One of them, however, was a post-maintenance test flight, the other a normal commercial departure.

The other aircraft type that has cropped up in the accident lists this year having featured several times recently is the Xian MA60 twin turboprop utility/commuter aircraft, a modernised Antonov An-24 descendant. If perceptions regarding safety performance, rather than actual safety, are now going to drive passenger choices, airlines would be wise to review the way they operate their MA60s. ■



**An Air Canada A320 experienced a hard landing at Halifax airport in late March**

data," says Russia's Interstate Aviation Committee. The inquiry points out that the aircraft dived after its elevators moved into the nose-down demand position. It says there was no evidence of technical failure on the aircraft, nor any indication that it was affected by icing, windshear or wake turbulence.

The CRJ200 had been attempting to land in poor visibility following a service from Kokshetau on 29 January 2013. While flight data shows the aircraft was stable on its approach, the cockpit voice recorder indicates that the captain was extremely frustrated by the weather conditions at Almaty, which he had hoped would improve before the arrival.

The inquiry says that, although the aircraft continued on its approach, the cockpit recordings show that there was no intention to pur-

sue a landing below minima, and the captain called for a go-around.

Fifteen seconds before impact, at a height of 180m, the autopilot was disengaged, when the aircraft was flying at 140kt (259km/h) and descending at around 600-800ft/min. Its flaps started retracting while the engines' thrust increased. But just 4s after the autopilot disconnection the elevator began deflecting into the pitch-down position. An automated call-out told the crew that the CRJ200 was at 500ft and the airspeed increased to 150kt. The horizontal stabiliser's position remained unchanged but the aircraft pitched increasingly nose-down. "Despite the increase in airspeed and [descent], the crew did not take action to put [the aircraft] into a climb," says the inquiry.

Less than 5s after the aircraft entered the dive, its ground-proximity

### The inquiry says the aircraft dived after its elevators moved into the nose-down demand position

warning system cautioned on the sink rate and then began issuing urgent terrain alerts, instructing the pilots to pull up. But the aircraft's pitch demand remained nose-down, the attitude eventually exceeding 20° nose-down, from which the CRJ failed to recover. It struck the ground about 1.6km before the threshold of 23R.

Bombardier modelled the last 30s of the ill-fated flight as part of the effort to explain the accident. The simulations revealed nothing unusual in the aircraft's aerodynamic

behaviour, and that it had responded as designed to the elevator deflection. There were "no other external factors" contributing to the downward pitch, says the inquiry.

It states that, in the absence of any system failure, the elevator deflection could have resulted from control inputs by the crew. The inquiry has struggled to resolve the mystery, saying that there is "no logical reason" for the initiation of the fatal dive when the aircraft should have been climbing for the missed approach. Investigators have considered somatogravic illusion – a strong but false perception of the aircraft's pitch caused by linear acceleration – but rejected it because the flight-data recorder revealed slight changes in the CRJ's elevator deflection during the dive that are not characteristic of the effects of the illusion. ■

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# ACCIDENTS AND INCIDENTS

## JANUARY–JUNE 2015

### NOTES ON TABLES

Data comes from *Flight International*'s research in association with Flightglobal advisory service Ascend, which compiles the World Aircraft Accident Summary, among other safety analysis products. Details of non-fatal incidents are not made available officially by authorities in many countries, but *Flight International* continues to list known significant incidents to maximise the availability of relevant information. We accept that the non-fatal listing may be weighted against the airlines of those countries that make safety information more readily available.

### GLOSSARY OF TERMS AND ABBREVIATIONS

<b>AA</b> airfield approach/early descent	<b>EFIS</b> electronic flight-instrument system	<b>GPWS</b> ground proximity warning system	<b>PF</b> pilot flying
<b>AAIB</b> UK Air Accidents Investigation Branch	<b>EGPWS</b> enhanced ground proximity warning system	<b>HP</b> high pressure	<b>PNF</b> pilot not flying
<b>AAL</b> above airfield level	<b>EGT</b> exhaust gas temperature	<b>IFR</b> instrument flight rules	<b>RA</b> runway/final approach
<b>ACARS</b> automatic communication addressing and reporting system	<b>EICAS</b> engine indicating and crew alerting system	<b>ILS</b> instrument landing system	<b>SID</b> standard instrument departure
<b>ADC</b> air-data computer	<b>ER</b> en route	<b>IMC</b> instrument meteorological conditions	<b>TAWS</b> terrain awareness and warning system
<b>ADF</b> automatic direction finder	<b>ETOPS</b> extended-range twin operations	<b>ISA</b> international standard atmosphere – sea level pressure of 1013.2hPa and standard temperature/pressure lapse rate with altitude	<b>TO</b> take-off
<b>AF</b> air force	<b>FAA</b> US Federal Aviation Administration	<b>L</b> landing	<b>TOGA</b> press-button selected take-off/go-around thrust
<b>AGL</b> above ground level	<b>FDR</b> flight data recorder	<b>LP</b> low pressure	<b>VASI</b> visual approach slope indicator
<b>AMSL</b> above mean sea level	<b>FL</b> flight level = altitude, in hundreds of feet, with international standard pressure-setting (ISA) of 1013.2mb set on altimeter (eg FL100 – altimeter reading of 10,000ft with ISA set)	<b>MEL</b> minimum equipment list	<b>VFR</b> visual flight rules
<b>AOA</b> angle of attack	<b>FMS</b> flight management system	<b>MTOW</b> maximum take-off weight	<b>VHF</b> very high frequency
<b>ASI</b> airspeed indicator	<b>G</b> on ground	<b>NDB</b> non-directional beacon	<b>VMC</b> visual meteorological conditions
<b>ATC</b> air traffic control	<b>GPU</b> ground power unit	<b>NTSB</b> US National Transportation Safety Board	<b>VOR</b> VHF omni-range navigation beacon
<b>C</b> climb		<b>PAPI</b> precision approach path indicator	<b>V<sub>1</sub></b> take-off decision speed
<b>C-B</b> circuit breaker		<b>PAX</b> passengers	
<b>CFIT</b> controlled flight into terrain			
<b>CNK</b> cause not known			
<b>CVR</b> cockpit voice recorder			
<b>DME</b> distance measuring equipment			
<b>ECAM</b> electronic centralised aircraft monitor			

Date	Carrier	Aircraft type/registration	Location	Fatalities (crew/pax)	Total occupants (crew/pax)	Phase
<b>FATAL EVENTS: SCHEDULED PASSENGER FLIGHTS</b>						
24-Mar	Germanwings	Airbus A320 (D-AIPX)	Barcelonette, France	6/144	6/144	ER
The aircraft was carrying out a scheduled flight from Barcelona to Dusseldorf. When the captain was out of the flightdeck early in the cruise, the co-pilot refused him re-entry and put the aircraft into a high speed descent until impact with the ground. Releases by the French prosecutor and the investigator (BEA) based on FDR and CVR information suggest the co-pilot's action was deliberate.						
<b>FATAL ACCIDENTS: NON-SCHEDULED PASSENGER FLIGHTS</b>						
20-Jan	Olimp Air	Antonov An-2 (UP-A0314)	North of Bishkek, Kazakhstan	6	7	ER
The aircraft, more than 40 years old, was chartered by a minerals company to take employees from Balkhash to a mine.						
25-Jun	Promech Air	DHC Vazar Turbine Otter (N270PA)	Nr Ella Lake, Alaska, USA	1/8	1/8	ER
The commercial excursion flight, operating out of Ketchikan, was carrying passengers from a Holland-America cruise liner on a sightseeing trip in Alaska's Misty Fjords when the aircraft hit high ground.						
<b>FATAL ACCIDENTS: REGIONAL AND COMMUTER AIRLINES</b>						
04-Feb	TransAsia Airways	ATR 72-600 (B-22816)	Taipei Sung Shan airport, Taiwan	4/39	5/53	C
The No 2 engine flamed out in the early climb after take-off, but mistakenly the crew retarded the throttle for the No 1 engine and closed the fuel shut-off valve for it. With about 1,400ft height the crew did not have sufficient time to identify what had happened and attempt a successful relight of the No 1 engine. Descending with no power and with the stall warning operating, the aircraft's left wing dropped to about 90° bank and struck a roadside barrier before the ATR crashed into the Keelung river. The Taiwan investigator has since revealed that the aircraft's automatic take-off power control system (ATPCS) had not been armed when the crew began the departure roll. The monitoring pilot voiced this fault, which the airline says is trained as an abort condition, but the take-off was continued. The ATPCS provides automatic support – including trim and auto-feathering – in the event of an engine failure during take-off.						
<b>FATAL ACCIDENTS: NON-PASSENGER FLIGHTS</b>						
13-Apr	Carson Air	Swearingen Metro II (C-GSKC)	Nr Vancouver, Canada	2	2	C
The aircraft disappeared from radar only a little more than 5min after departure from Vancouver. Canada's Transportation Safety Board says radar shows a rapid descent from a flight path apex of about 7,000ft altitude that was consistent with loss of control. Before that point the crew had not indicated any problems, and there was no emergency call.						
02-Jun	Aeronaves	Swearingen Metro (XA-UKP)	Santiago de Queretaro, Mexico	5	5	C
Soon after take-off for a post-maintenance test flight, the aircraft was recorded on video in an almost vertical dive about 6nm from the airport.						

Date	Carrier	Aircraft type/registration	Location	Injuries (crew/pax)	Total occupants (crew/pax)	Phase
<b>SIGNIFICANT NON-FATAL ACCIDENTS/INCIDENTS (ALL COMMERCIAL AIRLINE OPERATIONAL CATEGORIES)</b>						
02-Jan	<b>Flybe</b>	<b>Saab 340B (G-LGNL)</b>	Stornoway airport, Scotland	-/-	3/25	TO
The Loganair-owned aircraft, inbound from Glasgow to land on runway 18 at Stornoway, veered off the runway to the left and its nose gear collapsed on the soft ground. The wind was westerly at 22kt gusting to 33kt, visibility good, temperature 5°C.						
03-Jan	<b>KAPO Avia</b>	<b>Antonov An-26B (RA-26082)</b>	Magadan-Sokol, Russia	-	8	TO
The crew aborted take-off at more than 130kt and overran the end of the runway in snowy conditions. The right main gear collapsed, damaging the propeller and wingtip. The crew had failed to complete their take-off checks so the control gust-locks were still engaged, hence the elevator would not move.						
10-Jan	<b>ASKY Airlines</b>	<b>Boeing 737-400F (ET-AQV)</b>	Accra Kotoka airport, Ghana	3	3	L
During the daylight landing on runway 03, the aircraft, inbound from Lome, Togo, veered off the side of the runway and ground-looped, causing all the gears to collapse and the right engine to separate. There was a strong, gusting wind and visibility was reduced by dust and haze.						
11-Jan	<b>Trigana Air Service</b>	<b>DHC Twin Otter (PK-YRU)</b>	Enarotali airport, Indonesia	-	3	L
Inbound from Tembagapura, the aircraft landed in windy conditions and veered off the runway. The nose-gear collapsed and both propellers were damaged.						
23-Jan	<b>Air Inuit</b>	<b>Bombardier Dash 8 (C-FYAI)</b>	Umiujaq airport, Quebec, Canada	-/-	3/27	TO
There was a tailstrike at rotate, but the crew did not notice it and continued to their destination, Kuujjuaqapik, where the damage was found to be substantial.						
02-Feb	<b>Sky Express</b>	<b>BAe Jetstream 41 (SX-DIA)</b>	Rhodes Diagoras airport, Greece	-/-	2/14	L
Landing on runway 07, inbound from Heraklion, Crete, with wind from the southeast and a windshear alert active at the time, the aircraft encountered windshear and landed hard. The left main gear collapsed.						
03-Feb	<b>Garuda Indonesia</b>	<b>ATR 72 (PK-GAG)</b>	Lombok airport, Indonesia	-/-	4/25	L
The aircraft, inbound from Denpasar, Bali, veered off runway 13 on landing and the nose gear collapsed.						
15-Feb	<b>Air India</b>	<b>Airbus A321 (VT-PPD)</b>	Mumbai International airport, India	-/-	7/187	L
On a daylight approach in 4,000m visibility the aircraft made a hard, bounced landing and tailstrike on runway 27. The first touchdown registered 1.66g, and after the bounce the deceleration was more than 3g.						
24-Feb	<b>Jazz</b>	<b>Bombardier Dash 8 (C-GTAI)</b>	Sault Sainte Marie airport, Ontario, Canada	-/-	3/15	L
On a night approach inbound from Toronto, the aircraft touched down about 150m short of runway 30, but continued forward until coming to a stop on the runway. The gear suffered major damage.						
26-Feb	<b>Cargojet Airways</b>	<b>Boeing 757 (C-GIAJ)</b>	St John's airport, Newfoundland, Canada	-	2	G
The aircraft began to slide sideways across the icy ramp as the crew attempted to taxi the 757 to its parking position. There were strong, gusting winds. The crew were unable to stop the slide, and the aircraft continued 60m until it hit a building at the edge of the ramp, which was reported as being 80% covered by ice.						
04-Mar	<b>Turkish Airlines</b>	<b>Airbus A330-300 (TC-JOC)</b>	Kathmandu Tribhuvan airport, Nepal	-/-	11/227	L
The aircraft, inbound from Istanbul, carried out a VOR/DME letdown to runway 02, and abandoned it at about 1nm DME. The aircraft circled for a second approach, but on landing it veered off the left side of 02 and the nose gear collapsed.						
04-Mar	<b>Deraya Air Taxi</b>	<b>BAe ATP freighter (PK-DGB)</b>	Wamena airport, Indonesia	-	2	L
On a daytime approach to runway 33 in low cloud and heavy rain the aircraft tracked to the left of the extended centreline. When it touched down the aircraft heading was at an angle to the runway centreline, and it ran off the right side into the grass. The crew brought it back on to the runway but the nose undercarriage and left main gear collapsed.						
05-Mar	<b>Delta Air Lines</b>	<b>Boeing MD-88 (N909DL)</b>	New York LaGuardia airport, USA	-/-	5/125	L
Landing from an ILS approach to runway 13 in freezing fog with about 800m visibility and a light crosswind from the left, the aircraft veered off the runway to the left and destroyed a long section of the perimeter fence with its wing before coming to rest, its forward fuselage resting on a berm and nose protruding over Flushing Bay.						
08-Mar	<b>SpiceJet</b>	<b>Bombardier Dash 8 (VT-SUA)</b>	Hubli airport, Karnataka, India	-/-	4/74	L
Following a night approach in heavy rain associated with thunderstorms, the aircraft veered off the runway and its left main gear collapsed.						
14-Mar	<b>Malaysia Airlines</b>	<b>Airbus A330 (9M-MTA)</b>	Melbourne airport, Australia	-/-	?/?	L
A heavy landing caused major damage to the main gear, but the aircraft was able to taxi to the gate and disembark the passengers normally.						
29-Mar	<b>Air Canada</b>	<b>Airbus A320 (C-FTJP)</b>	Halifax airport, Canada	-/23	5/133	L
The aircraft, on a flight from Toronto, was carrying out a night localiser-only approach to runway 05 in snow with poor visibility and a crosswind from the left. On short final approach the aircraft hit power lines about 250m short of the runway and then impacted a localiser antenna array. The gear was severely damaged, both engines separated, and there was extensive damage to the aircraft belly and the wing and tail leading edges.						
14-Apr	<b>Asiana Airlines</b>	<b>Airbus A320 (HL7762)</b>	Hiroshima airport, Japan	-/-	8/74	L
The aircraft was on a night-time satellite-guided RNAV approach to runway 28, inbound from Incheon, South Korea, when it hit an approach light at a height of 4m before striking the localiser antenna array some 325m short of the runway 28 threshold, then veered left off the runway suffering substantial airframe damage. Preliminary findings by the Japan Transport Safety Board report light rain and fog giving 300m RVR. The aircraft initially followed the correct descent profile says the JTSB, but after its autopilot was disconnected at around 2,100ft it began to drift below the normal glidepath with its airspeed constant at around 130kt. The glidepath deviation gradually became more pronounced until the aircraft hit the localiser.						
16-Apr	<b>Key Lime Air</b>	<b>Swearingen Metro III (N2691W)</b>	Nr Rifle, Colorado, USA	-	1	C
During the night climb out of Rifle en route to Denver the No 2 engine suffered an uncontained second stage turbine failure and a fire warning. After completing shutdown and fire drills the pilot diverted to Grand Junction Regional Airport, Colorado where he landed safely. Turbine sections had smashed through the engine casing and penetrated the aircraft fuselage.						
20-Apr	<b>Wings Air</b>	<b>ATR 72 (PK-WGS)</b>	Sumbawa Besar airport, Indonesia	-/-	3/70	L
The aircraft made a hard (+4.8g) bounced landing at Sumbawa Besar. The crew carried out a go-around and returned to Lombok where a safe landing was made some time later. The weather conditions and visibility were poor.						
25-Apr	<b>Turkish Airlines</b>	<b>Airbus A320 (TC-JPE)</b>	Istanbul Ataturk airport, Turkey	-/-	6/91	L
The aircraft rolled right just before touchdown on runway 05, caused serious damage to the right main gear and the engine casing, and the crew decided to go around. During its climb away flames were observed in or near its No 2 engine. The aircraft made an approach to runway 35L, but on touchdown the right main gear failed, the No 2 engine struck the runway and the aircraft slewed right nearly 180°, coming to rest off the runway.						
05-May	<b>AirAsia</b>	<b>Airbus A330 (9M-XXW)</b>	Kathmandu airport, Nepal	-/-	314	L
The main undercarriage was damaged in a hard landing on runway 02, although the landing was completed safely. Reports say the aircraft developed a high rate of descent during short final approach. This may have been caused by windshear.						
10-May	<b>Joy Air</b>	<b>Xian MA60 (B-3476)</b>	Fuzhou airport, China	-/-	7/45	L
The aircraft made a very heavy landing (+6g) on runway 03, the wing and engines twisted downward, and the aircraft came to rest about 500m beyond the runway threshold and about 50m to the right of the runway. It seems the co-pilot, who was pilot flying, retarded the power levers into the "ground idle" quadrant while the aircraft was still about 40ft above touchdown, and the aircraft's rate of descent became very high. The weather conditions and visibility were good.						

**Cargolux upgraded its Boeing FFS after extensive testing**



AirTeamImages

# UNREAL FLYING

Most flight simulators don't reproduce the movements of an aircraft very well, but there are enhancements available that give a more realistic experience – and could save lives

DAVID LEARMOUNT LONDON

**S**imulation is an essential tool for improving flight safety through better pilot training, but it could be even more effective, according to some in the industry. Indeed, airlines such as Lufthansa, Cathay Pacific and Cargolux – as well as the US Air Force – have recently decided on simulator motion-system upgrades to enhance their training programmes.

The main limitation of simulator training is the lack of ability to simulate the sustained accelerated flight conditions that the human occupants – the pilot trainees – will recognise and react to as they would in real life. In normal flight manoeuvres this is not critical because accelerations are gentle and brief, but it

means that when training pilots to manage flight upsets, the situations from which recovery to safe flight can be practised effectively may be unusual, but not extreme.

Nevertheless, upset prevention and recovery training (UPRT) in simulators can still be highly effective for teaching pilots the priorities for recovery. Pilots need to have a drill that can be coolly followed, because in reality an upset – especially sudden or insidious – can bring confusion, disorientation and high stress.

The Air France flight 447 loss of control was a perfect example of what can go wrong: the attitudes and accelerations the pilots were confronted with were far from extreme, but they were unexpected and confusing, and the pilots were unable to recover.

The subject of UPRT for pilots has gone a little quieter in the industry recently, but it is still seen as a necessary weapon against the commercial air transport industry's biggest killer and destroyer of aeroplanes: loss of control in flight (LOC-I). Other solutions – such as training in a fully aerobatic aircraft – are expensive and take pilots off the duty roster for several days.

As a result, the only tool most airlines are prepared to wield against LOC-I – if they do any specific training related to the risk – is a simulator. Indeed, in April Canadian simulator manufacturer CAE announced it had received approval from the US Federal Aviation Administration and EASA for a purpose-designed UPRT instructor station.

**All pilots recognise that “flying” a simulator is more difficult than flying the real aircraft**

But there is another problem still endemic in most simulators: “flying” the simulator manually does not feel particularly like flying the aircraft it is supposed to represent, so any manual flight training in simulators does not transfer well to flying the real aircraft with stick and rudder. The way the simulator motion system works as it attempts to imitate reality – and the effect this has on the body’s sensitive balance mechanisms – tends to induce over-controlling by the pilot.

All pilots recognise that “flying” simulators is more difficult than flying the aircraft. Indeed, each recurrent training period partly consists of pilots re-learning how to “fly” the simulator. On return to the line, conversely, they need to re-learn the manual skills on the aeroplane, and they are given rather less practice at this.

#### UNFAMILIAR AIRCRAFT

Also, instructors know that when pilots, especially those with relatively few flying hours, come to the end of type-rating training on an unfamiliar aircraft – despite the fact that the full flight simulator (FFS) in which they have trained is certified for zero-hours conversion to line flying – they cannot be trusted with landing the real aircraft with passengers on board until they have done some base training (circuits and touch-and-goes) in the real thing.

But a couple of companies, not satisfied with this built-in limitation, have subtly modified the motion control software to produce motion that cleverly avoids confusing the human balance and acceleration-sensing organs in the inner ear.

Belgium-based technology company Acceleration Worx (AWx) provides a bolt-on simulator motion modifier called Lm2 (lateral manoeuvring motion). The secret is a rewritten simulator motion control algorithm. Cargolux Airlines International and Lufthansa Flight Training at Frankfurt am Main are its latest converts, and they have selected Lm2 to improve the effectiveness of the motion systems on their Boeing 747-8 FFSs. After a long trial period with Lm2, both Cargolux and Lufthansa Flight Training decided to upgrade. Cathay Pacific did the same a while ago.

Last year, after extensive testing, the US Air Force decided on an Lm2 upgrade for all 19 of its Boeing KC-135 operational flight trainers. CAE USA, prime contractor on the USAF KC-135 Aircrew Training System programme, performed the upgrades.

Flightglobal “flew” a 737 simulator with an Lm2 motion system upgrade some years ago when it was first being launched by the company, then called Sabena Flight Academy – Development (SFA – D). The performance was impressive (*see box*).

Another relative newcomer to simulator manufacturing is Lockheed Martin. Since it acquired Sassenheim, Netherlands-based Sim

TESTING DAVID LEARMOUNT BRUSSELS ZAVENTEM

## WHAT'S IT LIKE TO "FLY" AN Lm2 SYSTEM?

“FLYING” A Boeing 737-300 FFS at SFA – D’s base at Brussels Zaventem, I asked for a crosswind and was given 30kt (55km/h) from the right. Conditions were good night visual, I did not use the flight director or autothrottle, and for this first attempt the Lm2 motion modifier was not active. I managed the take-off adequately, but on approach I deliberately displaced the aircraft well to the left of the extended centreline for Brussels runway 25L so that recovering against the cross-

wind by about 1nm (1.85km) on short final would provide plenty of lateral lurches as I lined up the crabbing aircraft for landing. I kicked off drift at about the right time and tried to keep the lurching machine on the runway. It was a seriously inelegant attempt.

SFA then froze the system and put me back on the approach to do the same thing, but this time with the Lm2 operating. It was a transformation. The simulator handled like the aircraft would. Its reactions to control inputs were

predictable and natural. Just to prove the resulting safe landing was not a fluke, SFA suggested I try starting another approach to 25L and then do a late switch to 25R, but this time with crosswind from the left.

It was a delight to do, and the landing was quite good. Leaving the runway entailed a left turn through about 130°, and the tiller allowed me to keep the nosewheel perfectly on the centreline all the way without any swinging or over-correction. ■



David Learmount tries the 737 simulator – with and without the motion modifier

Industries in 2011, the latter’s integration into the brand as Lockheed Martin Commercial Flight Training (LMCFT) has now been completed, and the parent company has begun signalling its product differentiators to make its market presence felt.

#### ELECTRO-PNEUMATIC DRIVE

One particular differentiator is the motion system for the Level D FFS devices: both the hardware and software are new. The motion system drive, manufactured by Moog in the UK, is electro-pneumatic. The engineers explain that subtle manoeuvring motion is mostly provided directly by an electrically driven rack-and-pinion six-axis system, but more emphatic manoeuvres involve a boost from pneumatic pumps backed up by a capacious pneumatic accumulator. Most other manufacturers have moved from using the

traditional electro-hydraulic motion systems – now out of favour – to pure electrical drive, so the electro-pneumatic system is unusual.

LMCFT business development and strategy director Neil Tomlin says simulator customers are becoming more demanding: they want a simulator that trains pilots to fly better, not just a sophisticated procedures-and-systems trainer. They are acutely aware of the prevalence of LOC-I as today’s primary cause of fatal accidents. They want simulation fidelity all the way to full stall and to other encounters with the edges of the flight envelope, plus the most effective possible training for upset recovery. LMCFT says it works with every customer to deliver the combination of hardware and software that meets their training priorities, and this seems to be a winner. Despite being a newcomer, LMCFT has sold 10 FFS across a range of aircraft types. ■

# THREE-STAR RADAR WAR

Incumbent Northrop Grumman is pushing hard to win a US Air Force contract to replace its JSTARS surveillance fleet, but two big-hitting rivals have other ideas

JAMES DREW MELBOURNE, FLORIDA

**A**n effort to recapitalise the Northrop Grumman E-8C Joint Surveillance Target Attack Radar System (JSTARS) with a modern business jet is shaping up to be this summer's blockbuster defence programme, with three solid industry teams now vying for the \$6.5 billion prize and Raytheon working on a curious new airborne radar called "Skynet".

Northrop (the incumbent prime contractor), Lockheed Martin and Boeing have competing JSTARS proposals and are in a "blackout period" with no communication with the US Air Force as it decides whether to put two or all three teams on contract for an 11-month "pre-development" risk-reduction programme. The decision is expected in late August or early September, the air force says, and the main downselect to a single design will occur in late 2017.

JSTARS Recap, as the programme is known, officially started this year and aims to replace 16 large and expensive Boeing 707-300-based E-8C ground-looking battle management, surveillance and moving target indicator aircraft with 17 militarised business-class aircraft by 2026.

At Northrop, this is seen as a must-win com-

petition and it represents more than just a large business opportunity. The company practically invented JSTARS and owns the original patent. Now, it is being forced to defend that position and must fend off Lockheed and Boeing to retain its hold on the mission.

The company has expected this requirement for some time. Several years ago it purchased a Gulfstream GV demonstrator jet that is "550 representative" as a testbed aircraft to trial new radars and mission systems, while also showing the government what is possible.

*Flight International* viewed the aircraft, which carries the G550 tag on its tail, at the company's Manned Aircraft Design Center of Excellence in Melbourne, Florida – which is considered the birthplace of the E-8, even though the operational fleet is based about 500 miles north at Robins AFB in Georgia. Northrop is the only prime contractor to have assembled a dedicated JSTARS demonstrator, which it says is a "70% solution".

Northrop – or Grumman more specifically, before it was acquired – has been in the JSTARS business since before the programme started in 1985. The USAF has invested approximately \$20 billion in the radar-carrying platform since its inception, and the recapitalisation is estimat-



The US Air Force expects to begin retirement of its E-8Cs from 2019

ed to be worth another \$6.5 billion.

"We are the domain experts," Alan Metzger, Northrop's vice-president and programme lead for next-generation JSTARS, says. "We have been in this mission area for 30 years and have built a tremendous partnership with the air force, and we think it's relevant in tomorrow's fight. If the air force wants to recapitalise, we don't think there's anybody in a better position to figure out how to help them do that."

Exactly what a JSTARS aircraft does is summed up in a Grumman advertisement printed in a 1991 copy of *Flight International*. It shows what was famously labelled the "Mother of all Retreats" – columns of Iraqi armour fleeing north out of Kuwait City along the infamous "Highway of Death" into Basra, Iraq.



Northrop Grumman is employing a GV demonstrator for equipment flight trials

Northrop Grumman



US Air Force

A JSTARS crewmember prepares for take-off

Two early prototype JSTARS had been deployed to a base in Saudi Arabia and, along with other assets monitoring this fatal mass movement from above, they guided American and Canadian attack aircraft – as well as assault troops on the ground – to attack fleeing Iraqi forces in a final, devastating blow that ended the war.

#### NEW ERA

With its 7.3m (24ft) phased array antenna and a dozen or so battle managers on board, those JSTARS aircraft ushered in a new era of unprecedented situation-awareness for US forces, even though the USAF purchased a relatively small fleet – just 17 operational aircraft (one crashed). The last one was delivered in 2005. The two prototypes flew 54 combat sorties in the first Gulf War, and the fleet has since notched up combat successes in Bosnia, Croatia, Afghanistan, Iraq and Libya.

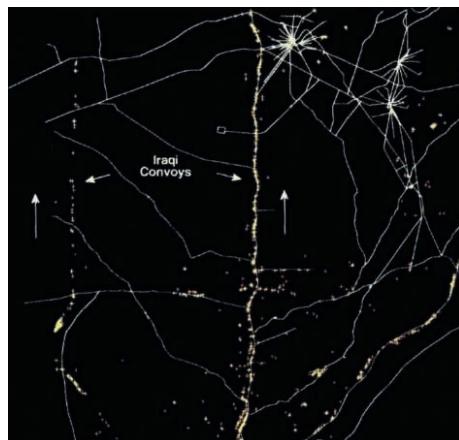
Lt Gen (Ret) Robert Elder, a former JSTARS pilot and commander of the 8th Air Force, says the aircraft really proved its worth during operational testing as part of the NATO air campaign in Bosnia in 1995. "The Serbian air force was pounding on the Bosnians, the Croats," he recalls. "[We] brought over NATO air power, and this is where they really found out how powerful JSTARS could be in terms of locating where they had troops.

"Any time the Serbians would mass for an attack, they would show up on JSTARS and it was easy to see. We would send NATO attack aircraft in so they could never, ever actually put together a force that was optimised to fight."

Elder says JSTARS aircraft were used during the Global War on Terrorism in the 2000s to monitor Iraq's porous borders with Syria, Jordan and Iran, as well as many other missions.

In Operation Enduring Freedom in Afghanistan, the aircraft provided convoy overwatch for army and marine units until the armed General Atomics Aeronautical Systems MQ-1 Predator unmanned air vehicle assumed the role. It was also used to monitor patterns of life over vast distances, and it could tell where Taliban forces were crossing into Pakistan, and where their stop-off points were. "It's about a 50,000km<sup>2</sup> area you can cover at any one time," says Elder; now a professor at George Mason University and a Northrop consultant.

As successful as JSTARS has been on the battlefield, the programme has one huge flaw: its aircraft are very, very old. So old, in fact, that the



JSTARS captured Iraq's retreat from Kuwait

air force was looking to replace the second-hand, refurbished 707 freighters even before the final aircraft rolled off the line 10 years ago.

Using repurposed 707s that were already 20 to 30 years old turned out to be far less economical than imagined, and their antiquated engines were never replaced. A re-engining programme was aborted when the air force started exploring alternative aircraft options.

An analysis of alternatives in 2011 concluded that a modern, mid-size business-class jet that requires fewer crew members would be far cheaper to operate and maintain. Downsizing JSTARS would also open up new

#### "Any time the Serbians would mass for an attack, they would show up on JSTARS"

**Lt GEN (RET) ROBERT ELDER**

Former JSTARS pilot

basing options, and allow the aircraft to deploy closer to their targets, whether in Africa, Asia, the Middle East or Europe. The air force has not clearly articulated what size it would prefer, only saying "something between a Gulfstream 550 and Boeing 737-700".

That is exactly what is on offer, and the choice of platform could potentially be where the contract battle is won or lost.

The primary considerations the air force will be looking at when assessing its platform options are cost, range, altitude, fuel consumption, and radar interference from the aircraft, plus basing options and how easily the crews could migrate to the new platform.

Northrop opted for a Gulfstream commercial business jet, and intends to offer the G550 unless the requirements shift considerably. The G650ER is also an option if the USAF requires longer range or more cabin space, but cannot carry as much weight. The G550 would be powered by two improved-performance Rolls-Royce engines,

» which give increased power over the standard commercial configuration.

"We did a risk-reduction study where we evaluated over 100 airplanes. We believe migrating the 707 to a Gulfstream-class business jet from a cost, risk and performance perspective yields the best opportunity," Metzger says.

He says the G550 can climb to 41,000ft in 20min and its high-set engines and smooth undercarriage greatly reduce radar interference. Metzger says the size, weight and power of the radios and mission systems have reduced so much since the 1980s and 1990s that the jet can carry everything the system needs.

Lockheed intends to offer a Bombardier Global-series platform, which is comparable to the Gulfstream offering in terms of size, cost, performance and engine position. It cannot yet confirm the specific aircraft, but programme manager Eric Hofstatter points to the Global series' "affordable price, large cabin, high altitude and long endurance".

Boeing comes to the table with the largest aircraft offering: a business jet from its 737 product line, the BBJ1, which combines the -700 fuselage with -800 wings for greater range and weight capacity. Rod Meranda, who heads Boeing's JSTARS capture team, says the aircraft is only marginally larger tip-to-tip than the Gulfstream and Bombardier business jets, but has far more cabin space and can carry more weight.

He adds: "We meet or exceed every [draft] requirement. We're not trying to sell this as a growth airplane, but we're trying to say it's the right size airplane to minimise risk from the integration standpoint."

#### DEMONSTRATING CAPABILITY

According to the air force's latest JSTARS Recap schedule, two "green" test aircraft are required in the development phase for delivery by 2019.

Northrop has opted not to wait that long, and believes it could put a full-up prototype into the air much sooner.

The company has US Federal Aviation Administration-certified the radar canoe modification on its testbed aircraft, and has tried to



#### "Our software is real, our people are knowledgeable, and we're ready to go"

**ALAN METZGER**

Northrop VP and programme lead for next-gen JSTARS

limit changes to the commercial baseline wherever possible. Over the past year, the aircraft has visited the Hanscom, Langley, Andrews and Robins bases, and the commanders of Air Combat Command and US Air Forces in Europe visited the demonstrator in Melbourne, following the Air Force Association conference in Florida in February.

Hofstatter says the Lockheed team has not yet assembled a demonstrator, but is strongly considering investing in one prior to the start

of the development. The company's Skunk Works division is leading the charge, and has set up a system integration laboratory to test its radar and battle management components.

To date, Boeing has committed only to the air force's development timeline of producing two test aircraft by 2019. Meranda says the company has a larger 767 testbed aircraft, but he doesn't "see us putting up a full-up JSTARS system in the prototype configuration" prior to securing a development contract.

The air force has stated that it would like to see as many demonstrator aircraft flying as the companies are willing to pay for, but it's not a requirement at this stage. "I'd like to see 10 flying prototypes," air force acquisition chief William LaPlante quipped at a recent Center for Strategic and International Studies event in Washington DC.

#### JSTARS RECAP: THE RIVALS

Prime bidder	Aircraft	Range/endurance	Cruise speed	Max take-off weight	Max cruise altitude	Passengers	Engines	Length	Wingspan
<b>Northrop Grumman</b>	Gulfstream G550	6,750nm	n/a	41,277kg	51,000ft	18	2 x Rolls-Royce BR710C4-11	29.4m	28.5m
<b>Lockheed Martin</b>	Bombardier Global 6000	6,000nm	Mach 0.88	45,132kg	51,000ft	13	2 x Rolls-Royce BR710A2-20	30.3m	28.7m
<b>Boeing</b>	737-700 BBJ1	3,200nm	Mach 0.78-0.82	78,000kg	41,000ft	121 (passenger transport configuration)	2 x CFM International CFM56-7	33.6m	34.3m
<b>Northrop Grumman JSTARS*</b>	707-300	9h	Mach 0.52-0.65	78,000kg	42,000ft	22 (4 flight crew, 18 mission)	4 x Pratt & Whitney TF33-102C	46.6m	44.4m

SOURCE: Boeing, Bombardier, Gulfstream, USAF. \*In service with USAF



**Boeing's 737-based BBJ1 offering is the largest option on the table**

chased later for initial operational capability in late 2023. The last 12 aircraft will be delivered under a full-rate production contract, for full operational capability in 2026. In the interim, the air force expects to begin retiring E-8C aircraft, beginning in 2019 as the recap programme matures.

This latest schedule represents about a one-year slip compared with an earlier draft version that was presented at an industry day in 2014.

Northrop believes it can go faster, and wants the air force to reconsider its timeline. The company has a head start as the original equipment manufacturer, and Metzger says his team has the infrastructure, personnel and know-how to deliver the E-8C replacement sooner, potentially avoiding upwards of \$1 billion in costs over current estimates: "If you go faster, you save money. Our software is real, our people are knowledgeable, and we're ready to go."

LaPlante, however, contends that it is better to "go slow to go fast". He prefers to front-load a programme so that as much work as possible is done in the materiel solutions phase prior to the government committing to a significant, multi-billion-dollar development effort.

"We'd like to get as many as three teams on programme, and get them working on risk-reduction activities. That's where they're funded by the government to continue the systems engineering flow down on identifying the high-risk items," LaPlante says.

"The ideal is to have three different companies at that point that have brought their solutions up to about a preliminary design review, and maybe even put their own money into a prototype. Then, when we're ready to do the real programme, we have something really good to start with." ■

At the same event, though, LaPlante cautioned that while the air force is fully committed to the programme, it could be delayed if defence spending drops: "We're serious about it, but the real commitment the government is going to have to make is in about three years."

#### SKYNET RADAR

As Northrop, Lockheed and Boeing battle for the prime contractor position, Raytheon is flying under the radar, so to speak, by offering its new Skynet sensor to all sides. The company is in a non-exclusive partnership with Lockheed, but says it will offer its radar – believed to be a 4.87m derivative of the Advanced Airborne Sensor carried on the Boeing P-8 Poseidon maritime patrol aircraft – to whichever company wants it.

According to Raytheon: "Skynet incorporates the latest innovations developed for the US Navy's stringent, wide-area surveillance requirements [and] meets or exceeds all JSTARS requirements for the lowest possible cost."

Lockheed confirms that it intends to carry Skynet on its business jet design, describing the radar as a "state-of-the-art active electronically scanned array [AESA], long-range, ground-surveillance radar".

Northrop says it is closely examining Raytheon's radar offering, but could also choose its own ground-looking AESA radar, depend-

ing on the final JSTARS requirements. Metzger's team has been conducting trials with several different radar types at its radar test facility in Melbourne.

According to the USAF's fiscal year 2016 budget documents, the first two aircraft will be procured as part of the development contract due to be awarded in the fourth quarter of budget year 2017, and another three production-representative aircraft will be pur-



**Lockheed Martin sees an ultra-long-range Global as 'uniquely suited' to the mission**



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## Powering the battery theory

Mr Chandless is right to query how Malaysia Airlines MH370 kept flying for so long after a supposed major cargo fire (*Flight International*, 14-20 July).

I'm confident Mr Straker (*Flight International*, 30 June-6 July) is better able than myself to outline the improvements in fire-hardening developed since 1988, but I'd point out the forward cargo hold of a Boeing 777 is a class C zone, free of critical flight controls, and with fire detection, controllable ventilation, fire suppression, fire and smoke containment, and fire-resistant liners.

It's now recognised lithium-ion batteries are capable of breaching these precautions. Behind the liners are air-conditioning ducting, avionics, and other systems. The hold was half-empty, containing 2,250kg of books, the same of electronic parts, and passenger luggage. It would appear the crew came close to saving the aircraft, despite an unexplained sequence of events leading to loss of communications and possibly the burn-

### CAPACITY

## The driverless car could be a star

Your excellent article on the options to increase the capacity of London airports (*Flight International*, 14-20 July) described only the conventional strategies – namely, building new runways.

We have been here before.

History suggests that because of the considerable social and capital constraints it is unlikely that any additional runways will be built. This leaves two generic options: to increase the throughput of aircraft and to maximise the efficiency of the "airport cluster" around London.

Practically all suggestions to improve the efficiency of the cluster by developing high-speed surface links between the several airports are based on rail transport, which itself requires significant capital. However, there may be alternatives, such as driverless cars, buses and trucks, that do not require much extra investment.

By the time any new runway or rail link is built, the concept of driverless vehicles, travelling in convoys, should be well established. If the motorways and feeder roads have dedicated lanes for these vehicles, then the convoy speed could be quite high. It is worth examining whether such a road transport system could enable improved connectivity between the individual airports in the cluster, so that additional runways are not necessary. It is not such a far-fetched idea. In Silicon Valley, driverless cars are fairly ubiquitous.

**David Nixon**

California, USA



Solving our traffic problem?

through of the hull, which might have given rise to the witness report of a "glowing" aircraft (*Flight International*, 3-9 March).

Other reports imply the aircraft made two course reversals, in a quest to find an illuminated runway or await daylight. Perhaps hypoxia came first.

The Inmarsat data indicate the flight ended due to fuel exhaustion, reducing the chances of a fuel slick. A debris field 100km off the south coast of Vietnam, spotted on 10 March 2014, lay close to the "7th arc", and seems to match all published information and the cargo-fire theory.

**Richard Lloyd**

Coventry, UK

## English devotee

I find myself completely confused! An item relating to Bluecopter (*Flight International*, 21-27 July) states: "...a new demonstrator that brings together a basket of new and existing platform-agnostic technologies...".

I have no idea what this means and I am uncertain if I should consult my local priest or an aeronautical engineer! Couldn't *Flightglobal* journalists just stick to plain English? Although on reflection it occurs to me that the person concerned did not understand the press release either.

**Richard Chandless**

Crèches sur Saône, France

## Flushing bullets

Your Straight & Level article "Taking a bullet" (*Flight International*, 21-27 July) reminded me of a similar incident when I was a captain on Boeing 727s with Kuwait Airways in the 1980s. In those days we carried a number of armed sky marshals on each flight.

It was on a flight from Kuwait to Amman that one came up to the flight deck and informed me he had dropped a bullet down the toilet. I was going to lock the toilet door, but the sky marshal was soon back with the bullet he had recovered off the first ledge of the toilet using a plastic bag over his hand. I accepted the solution.

**Peter Goodwin**

Amersham, Buckinghamshire, UK

## A windowless view on aircraft

July's issue of *Popular Science* includes an article entitled "Hyped Up".

It looks at proposals to run very fast passenger tubes just above ground level propelled via various means. These tubes will have no windows; instead there will be flat-panel displays on the walls, depicting various scenes. Could this soon be copied by airframers? Not having to put windows in a fuselage would reduce the cost considerably and provide a significant safety factor.

**David Clemow**

Auckland, New Zealand

## Unloved A380

The Airbus A380 has always been affected by a peculiar problem that no other airliner, old or new, ever had: it's ugly.

**Valerio Viola**

Verona, Italy



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## Your flight is now clothing

Regulars on low-cost airlines know the tricks for avoiding costly excess baggage fees. Don't try this one.

James McElvar was about to board an EasyJet flight from Stansted to Glasgow when he was told he would have to pay to check in one of his two pieces of luggage. Instead the 19-year-old wore the entire contents of his rucksack: four jumpers, six T-shirts, three pairs of jeans, two pairs of jogging bottoms, two jackets and two hats, reports the *Evening Standard*.

He became unwell with heat exhaustion during the flight and vomited before collapsing. An off-duty paramedic on board the flight came to his aid, and he was treated with oxygen.

"I thought I was a goner," said McElvar, a member of a Scottish boy band.

## Foot in mouth

A story from the *New Indian Express* – "Boeing Joins Hands with Tata Arm to Produce Spy Planes" – reminds Ian Goold of the famous *Times* headline from the 1980s regarding the nomination of a former UK Labour Party leader to chair a commission on nuclear disarmament: "Foot heads arms body".

Michael Foot had in the 1970s been considered as UK defence secretary and Goold, former production editor of this parish, claims *Budgie News* had lined up the very same headline had the cabinet reshuffle followed that route.



Foot: out on a limb



## Tractor biplane

Following the lead of the more important firms, most of the concerns building aeroplanes in the USA are turning their attention to military tractor biplanes, demonstrating the Americans' intention to seriously compete with European practice in this line.

## Airport on wheels

Air force authorities of more than one country are reported



to be interested in the preliminary tests of the mobile airport invented by American engineer KW Couse. Looking like a rather bulky delivery van, it can be sent across country to the rescue of aircraft in difficulties.

## Westland moves

Metal cutting will begin immediately at Cowes in the construction of the first Westland



SR.N4 160t cross-Channel air cushion vehicle. It is the first of two long-term charter contracts signed on 23 June by the Swedish Lloyd and Swedish America shipping lines, acting jointly, and Westland Charters.

## Instant ETOPS

Less than 18 months after American Airlines became



the first operator allowed to fly a twinjet up to 180min from the nearest diversion airfield, airworthiness authorities are being asked to define again how safe is "safe" when it comes to long-range twinjet flights over water.

## Winging it

Ever wondered what it would be like to wingwalk? Helen Tempest, who had a 30-year career performing the aerobatic stunts, is giving a talk on her exploits at air expos around the world at Cotswold Airport on 3 October.

Tempest, who began wingwalking aged just 15, finally hung up her goggles after returning briefly to wingwalking following the birth of her daughter. The evening will raise funds for the charity fly2help, which provides memorable flight experiences for people with life-limiting and chronic illnesses or disabilities.

Details from [fly2help.org](http://fly2help.org)

## Yuckspeak: a definitisation

"Surely Lockheed's comment (*Flight International*, 16-22 June, page 20) qualifies for Yuckspeak?" asks Peter Dennis.

We suspect he has a point: "This new contract definitisation award further defines the scope of work to complete the original contract,

but does not accelerate the current period of performance," reads the piece.

Notes our correspondent: "In other words, more time to complete the job they'd said would be finished."

## Meanwhile, back in Kansas...

It has been a while since the Paris air show wrapped up, but Textron AirLand's Scorpion jet was kept busy in Europe before heading for its home in Wichita on 20 July via stops in the Outer Hebrides, Iceland, Greenland, Canada and the USA.

Demonstrations since Le Bourget included visits to Bulgaria and Romania, as well as maritime surveillance work performed in tandem with Royal Navy Westland Sea King 7 helicopters.

"Textron was able to put the recently integrated Thales I-Master radar through its paces in a maritime environment," the company says, adding: "Large expanses of water are not readily available in Kansas."

The Atlantic is quite big, mind you.

## 100-YEAR ARCHIVE

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Registered at the Post Office as a newspaper.  
Published by Reed Business Information Ltd, Quadrant  
House, The Quadrant, Sutton, Surrey SM2 5AS, UK.

Tel: +44 20 8652 3500.

Newtrade distributed by Marketforce (UK) Ltd, Blue Fin  
Building, 110 Southwark Street, London SE1 0SU, UK.

Tel: +44 20 3148 3300.

Classified advertising prepress by CCM.

Printed in Great Britain by William Gibbons and Sons Ltd.

Flight International published weekly 49 issues per year.  
Periodicals postage paid at Rahway, NJ. Postmaster send  
changes to Reed Business Information, c/o Mercury  
International Ltd, 365 Blair Road, Avenel, NJ 07001

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ISSN 0015-3710 (Print) ISSN 2059-3864 (Online)

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**MAKS**  
Moscow, Russia  
[avia salon.com](http://avia salon.com)

**15-16 September**

**Flight Safety Symposium**  
London, UK  
[flightglobalevents.com/flight safety symposium2015](http://flightglobalevents.com/flight safety symposium2015)

**15-18 September**

**DSEI 2015**  
ExCel, London, UK  
[dsei.co.uk](http://dsei.co.uk)

**29-30 September**

**Aviation Partnership Summit**  
Amsterdam, The Netherlands  
[flightglobalevents.com/APS15](http://flightglobalevents.com/APS15)

**29-30 September**

**New Generation of Airline Passenger Systems**  
London, UK  
[flightglobalevents.com/pss2015](http://flightglobalevents.com/pss2015)

**1 October**

**US Corporate Aviation Summit**  
Fort Lauderdale, Florida  
[aeropodium.com/uscas](http://aeropodium.com/uscas)

**6-8 October**

**Helitech International**  
ExCel, London, UK  
[helitechevents.com](http://helitechevents.com)

**14-15 October**

**Aerospace Innovation Forum**  
Palais des congrès, Bordeaux, France  
[www.aerospace-innovation-forum.com](http://www.aerospace-innovation-forum.com)

**20-21 October**

**The Commercial UAV Show**  
ExCel, London, UK  
[terrapinn.com/exhibition/the-commercial-uav-show](http://terrapinn.com/exhibition/the-commercial-uav-show)

**8-12 November**

**Dubai Airshow**  
Dubai World Central  
[dubaiairshow.aero](http://dubaiairshow.aero)

**15-17 November**

**ALTA Airline Leaders Forum**  
San Juan, Puerto Rico  
[alta.aero/airlineleaders/2015](http://alta.aero/airlineleaders/2015)

**17-19 November**

**NBAA 2015**  
Las Vegas, USA  
[nbaa.org/events/bace/2015](http://nbaa.org/events/bace/2015)

**17-19 November**

**Aerospace & Defense Meetings Torino**  
Torino, Italy  
[bciaerospace.com/turin](http://bciaerospace.com/turin)

**19-20 November**

**Safety In African Aviation**  
Kigali, Rwanda  
[2gether4safety.org](http://2gether4safety.org)

**1-2 December**

**Military Airlift and Rapid Reaction Operations**  
Seville, Spain  
[smi-online.co.uk/defence/europe](http://smi-online.co.uk/defence/europe)

**8-10 December**

**Aerospace Meetings Brazil**  
São Paulo, Brazil  
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## Tenders

Request for Proposal:

Biman Bangladesh Airlines is operating four Boeing 777-300ER; two Boeing 777-200 ER; two Boeing 737-800; and two A310 aircraft. Two new Boeing 737-800 will be inducted in November and December 2015.

- i. The four Boeing 777-300ER aircraft are fitted with the Thales Top Series i5000 IFE having AVOD, Game, VA-PRAM-BGM.
- ii. The two Boeing 777-200ER aircraft are fitted with the MAS2000E IFE having only the broad cast Video/audio, Game (in B/C only), and VA-PRAM-BGM. The eight video players using the SVHS cassettes and audio player using CD. The BGM will be loaded by flush card.
- iii. The two Boeing 737-800 aircraft are fitted with the Rockwell Collins PAVES1 IFE having only the broad-cast Video/audio, BGM. The video players using the Hi-8 cassettes and audio player using CD. The BGM will be loaded by flush card.
- iv. The two Airbus A310 having only the broad-cast Video and using Hi-8 cassettes. The BGM of this aircraft playing by a four track Phillip cassette.
- v. The two upcoming Boeing 737-800 aircraft fitted with the Rockwell Collins PAVES3 IFE having AVOD, Game, VA-PRAM-BGM.

Now, Biman is in the process of selecting Content Service Provider (CSP) for supplying the following contents:

**Video:**

- i. English (Hollywood latest, classic, comedy, action, western, family, cartoon & children), Bengali, Hindi Movies.
- ii. Drama – Bengali (Tele-film, drama, magazine programme) and English.
- iii. Music Video-Bengali and English.
- iv. Documentary- Bengali and English.
- v. Safety Video / Video Announcement (VA).

**Game:**

- i. Game.

**Audio:**

- i. Bengali and English (different songs, instrumental...).
- ii. The Holy Quran recitation.
- iii. Boarding Music/ PRAM – Bengali and English.

The content service provider will have to provide contents/Programs with necessary licensing/copyrights/proprietary and other related documents for using those contents in Biman's Aircraft for passenger entertainment.

All programs are required to be encoded in a format that is compatible with above mentioned IFE systems installed on Biman fleet. The encoded contents will be forwarded by the CSP to Thales/Rockwell Collins/Biman for integration/loading by Thales/Rockwell Collins/Biman.

Contents may be revised in every 3/6 months interval.

Interested participants must have experience in providing CSP to reputed airlines.

You are therefore, requested to forward the proposal for contents along with available options and applicable terms & conditions and price by **19 AUGUST 2015** in a sealed envelope to the address: **Director Customer Services, Biman Bangladesh Airlines, Admin Building (Level-3), Kurmitola, Dhaka-1229, Bangladesh** or to email [dcsbiman@bdbiman.com](mailto:dcsbiman@bdbiman.com)

*Biman Bangladesh Airlines reserves the right to accept or reject any proposal without assigning any reason.*

Abdullah Al Hasan, Director, Customer Services & Chairman, IFE Committee, Biman Bangladesh Airlines

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## Air Traffic Control Officers

The Public Services Department of the States of Guernsey is seeking qualified Air Traffic Control Officers to provide ADI and APS services at Guernsey Airport.

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ATC at Guernsey Airport provides ADI and APS services in Class D airspace to a varied mix of traffic ranging from microlights to short haul airliners. An APS service is provided to Alderney Airport. A major airport rehabilitation project has recently been completed, and our new Thales PSR/Mode S MSSR radar is now operational. RNAV approaches are in frequent use at both islands.

The successful candidate will attract a salary range of up to £81,626 pa, according to experience. Successful candidates will be offered a relocation package.

Contact: Mr Frank McMeiken, Manager Air Traffic Control, Guernsey Airport on 01481 234950 or email: [frank.mcmeiken@gov.gg](mailto:frank.mcmeiken@gov.gg)

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# RECRUITMENT ADVERTISEMENT FOR CIVIL SERVICE VACANCY CIVIL AVIATION DEPARTMENT, GOVERNMENT OF HONG KONG SPECIAL ADMINISTRATIVE REGION

## Senior Operations Officer (Senior Operations Inspector)

**Salary:** Master Pay Scale Point 45 (HK\$94,905 approximately US\$12,167\* per month) to Master Pay Scale Point 49 (HK\$109,340 approximately US\$14,017\* per month) (See Note 1).

(\*Based on exchange rate of HK\$7.8 = US\$1) (subject to fluctuation)

**Entry Requirements:** Candidates should have (a) (i) a current Airline Transport Pilot's Licence (ATPL) (Aeroplane) with a current Class One Medical Certificate and eight years' relevant post-licence experience and at least 5,000 hours of commercial transport flying experience of which a minimum of 3,000 hours should be on civil transport multi-engine aeroplanes; **OR** (ii) an International Civil Aviation Organization contracting state's Commercial Pilot's Licence (CPL) (Aeroplane) with Multi-engine Instrument Rating; and a minimum of seven years' post-licence experience in civil aviation management and operations or as a regulator; and have passed the ATPL examinations; **AND** (b) strong command of written and spoken English.

### Notes:

- (1) Subject to the prevailing situation, candidates with additional experience may be granted increments for previous relevant experience in the civil aviation field in excess of the stipulated minimum. Please note that applications from the serving civil service Senior Operations Officers (Senior Operations Inspector) in the Civil Aviation Department would not normally be considered.
- (2) For the purpose of heightening public awareness of the Basic Law (BL) and promoting a culture of learning of BL in the community, assessment of BL knowledge will be included in the recruitment for all civil service jobs. Results of the BL test for degree/professional grades will be one of the considerations to assess the suitability of a candidate but will not affect his/her eligibility for applying for civil service jobs. As a general principle, the main consideration for suitability for appointment remains a candidate's qualification, experience and caliber.
- (3) Candidates should submit their application forms together with an **Experience Resume** by mail to the enquiry address on or before the closing date for application. The Experience Resume can be downloaded from the Civil Aviation Department's website. (<http://www.cad.gov.hk/english/recruitment.html>)

**Duties:** A Senior Operations Officer (Senior Operations Inspector) is mainly deployed on flight operations matters including – (a) conducting station facilities, ramp and base inspections, and other safety oversight inspections of the Air Operator's Certificates (AOC) holders to ensure that the operator's documentation with respect to operations and training manuals, and all other instructions to operating staff are in compliance with the established policies and standards; (b) observing professional pilot training, monitoring standards and ensuring that the training is carried out in accordance with all relevant legislation; (c) examining persons for appointment as authorized examiners for the grant of Private Pilot Licence and handling matters on Flying Training Organization and ground training courses; (d) investigation of aircraft accidents and incidents; and (e) assisting in the formulation of policies and requirements on flight standards and operations matters. (Notes: Post holders are required to travel extensively on duty and work irregular hours).

**Terms of Appointment:** A new recruit will normally be appointed on civil service agreement terms for three years. A gratuity may be granted upon satisfactory completion of the contract with consistently high standard of performance and conduct. The amount of gratuity payable will be the sum which, when added to the Government's contribution to the Mandatory Provident Fund Schemes, equals to 15% of the total basic salary drawn during the contract period. He/she will be required to serve on agreement terms for at least 3 years before they can be considered for appointment on the prevailing permanent terms.

**Enquiry Address and Tel. No:** For enquiry or request for an application form, please write to the Administration Division, Civil Aviation Department, Level 5, Office Building, Civil Aviation Department Headquarters, 1 Tung Fai Road, Hong Kong International Airport, Lantau, Hong Kong S.A.R., People's Republic of China. (Fax.: (852) 2910 6399) or e-mail to <[recruitment@cad.gov.hk](mailto:recruitment@cad.gov.hk)>, quoting reference "CAD PR/5-25/62 (2015)".

**Closing Date of Application:** 14 August 2015

### General Notes:

- (a) Persons who are not permanent residents of the Hong Kong Special Administrative Region (HKSAR) may also apply for this vacancy but will be appointed only when no suitable and qualified candidates who are permanent residents of the HKSAR are available.
- (b) As an Equal Opportunities Employer, the Government is committed to eliminating discrimination in employment. The vacancy advertised is open to all applicants meeting the basic entry requirement irrespective of their disability, sex, marital status, pregnancy, age, family status, sexual orientation and race.
- (c) Civil service vacancies are posts on the civil service establishment. Candidates selected for these vacancies will be appointed on civil service terms of appointment and conditions of service and will become civil servants on appointment.
- (d) The entry pay, terms of appointment and conditions of service to be offered are subject to the provisions prevailing at the time the offer of appointment is made.
- (e) The information on the maximum pay point is for reference only and may be subject to changes.
- (f) Fringe benefits include paid leave, medical and dental benefits, and where appropriate, assistance in housing.
- (g) Where a large number of candidates meet the specified entry requirements, the recruiting department may devise shortlisting criteria to select the better qualified candidates for further processing. In these circumstances, only shortlisted candidates will be invited to attend recruitment examination and/or interview.
- (h) It is Government policy to place people with a disability in appropriate jobs wherever possible. If a disabled candidate meets the entry requirements, he/she will be invited to attend the selection interview/written examination without being subject to further shortlisting.
- (i) Holders of academic qualifications other than those obtained from Hong Kong institutions/Hong Kong Examinations and Assessment Authority may also apply but their qualifications will be subject to assessments on equivalence with the required entry qualifications. They should submit copies of their official transcripts and certificates by mail to the above enquiry address.
- (j) Civil service vacancies information contained in this column is also available on the GovHK on the Internet at <http://www.gov.hk>
- (k) Towards the application deadline, our on-line system would likely be overloaded due to large volume of applications. To ensure timely completion of your on-line application, it is advisable to submit the application as early as possible.

**How To Apply:** Application Forms [G.F. 340 (Rev. 3/2013)] can be downloaded from the Civil Service Bureau of HKSAR's website (<http://www.csb.gov.hk>). **Candidates must state clearly the details of professional qualification obtained on the application forms and attach the Experience Resumes.** (See Note 3) Completed forms, together with the Experience Resumes, should reach the above enquiry address of the recruiting department on or before the closing date for application. Please specify the title of the post being applied for on the envelope. Online application can also be made through the Civil Service Bureau's website (<http://www.csb.gov.hk>). Candidates who apply online should submit the Experience Resumes within one week after close of application period to the above enquiry address, and the online application number should be quoted on the envelopes and the Experience Resumes. **If candidates fail to provide the Experience Resumes as requested by the deadline, their applications may not be considered.** Applicants are encouraged to provide their email addresses on the application forms. Candidates who are selected for interview will normally receive an invitation (by email or by post) in about six to eight weeks from the closing date for application. Those who are not invited for interview may assume that their applications are unsuccessful. For enquiries, please contact the department via the means stated above.

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- Minimum 500 hours PIC on the B737-300 to 900 series

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- Minimum 1,200 hours total flying time
- Minimum of 1000 hours on CS25\* Type Aircraft
- Minimum 800 hours on the B737-300 to 900 series

\* CS-25 Certification Specifications applicable to turbine powered Large Airplanes. An airplane of more than 5700 kg (12500 pounds) maximum certificated take-off weight

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Please note that this email address is only for pilots who meet the above criteria. Due to the high volume of contacts we cannot correspond with non-737 rated pilots through this address.



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## WORK EXPERIENCE DESIREE HORTON

# Fire-fighting pilot lives her dream

Having flown helicopters in all manner of capacities, from tour guide to covering the news, Desiree Horton's full-time job for the California Department of Forestry and Fire Protection fulfils her love of getting up in the air

## Where did the fascination with rotary-wing come from?

I really never had an interest in flying aircraft. My dad was a fixed-wing pilot, but somehow my interest was only in helicopters. I actually opened the yellow pages and looked for helicopter training and flight schools. This was 25 years ago, so the yellow pages was the way to find anything.

## Who first hired you?

I started out flying tours over Los Angeles. I flew customers over all of the celebrity homes and famous places in Los Angeles. From there that led to traffic watch, then eventually news. I was able to fly news in the off-season outside of fire fighting. I also flew construction, charter, police contracts, movie production flights, seismic, heliski, frost patrol, and more. There was always news work available and it allowed me to be close to home, whereas flying contract work I was out of state often living a very nomadic lifestyle. My goal was always to take jobs that would give me experience for my end goal, which was with a fire department.

## What's contract firefighting like?

Contract firefighting is seasonal, meaning that once the summer fire season ends, you are out of a job. The helicopter companies that I flew for maintained contracts with the United States Forest Service. I also flew on many different contracts outside



California Department of Forestry and Fire Protection

Horton has moved from showing off Los Angeles to saving lives

of California in other states. I spent many years on a rappel contract where I flew rappellers into the fires.

## Full-time is better?

Working for CalFire is my dream job that I have always wanted. My best description of it – it's like winning the career lottery. These jobs are few and far between. I feel very fortunate that I have this job and all of my hard work and sacrifices paid off to get where I am today. Although we are not in our peak fire season during the winter months in southern California, we staff our helicopters in the south year-round. There is the potential for fires and once our new base gets

## “There is a poem called The Helicopter is My Office. It's something I relate to”

up and running with our hoist programme, we will be doing hoist rescues year-round as well.

## What's dangerous about your job?

There are powerlines that you cannot see until you are very close or the sun hits them just right. I try not to dwell on the dangers of my job. I mitigate the risks as best I can and fly as safe as I can within the realm to get the job done, keep my

crew safe, and bring them and myself home every night. I love this job, even with the inherent dangers. There is a poem called The Helicopter is My Office. It's something I relate to.

## What do you enjoy about it the most?

Everything! I love my job. It is an honour and a privilege to work for CalFire and to wear a uniform every day at work that represents not only the department I work for but the pride I hold inside wearing my blues. I enjoy training and even just currency flights. We are required to stay current and that allows me the opportunity to get up in the skies and do what I love to do, which is fly. Just the other day, after days of rain here in southern California, I decided to do some mountain training and fly up to one of our higher peaks, Mt Baldy, where a few feet of fresh snow had covered the mountains in some areas. There were big white cotton ball-like clouds surrounding the snow-covered mountains. In all of my 25 years of flying, I have to say that was one of the most breathtakingly beautiful flights I have ever had. ■

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